EPIGENETIC GOLD OCCURRENCES, EASTERN AND CENTRAL DUNNAGE ZONE, NEWFOUNDLAND

GOVERNMENT OF
NEWFOUNDLAND
AND LABRADOR
Department of
Mines and Energy

D.T.W. EVANS

MINERAL RESOURCE REPORT 9

ST. JOHN'S,
NEWFOUNDLAND, 1996

COVER

Large extensional quartz vein, developed within the granodiorite rock, Charles Cove. The vein is laminated, locally vuggy and contains patches of arsenopyrite that have assayed up to 6.20 g/t Au.

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David T.W. Evans, P.Geo.

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ABSTRACT

In central Newfoundland, epigenetic gold occurrences comprise a widespread style of mineralization, the importance of which has only recently been recognized; and, so far, 118 occurrences have been documented. These occurrences cluster within structurally complex areas that are characterized by regionally extensive faults or terrane-bounding structures, which probably tapped deep fluid sources. The gold mineralization is classified as mesothermal or epithermal, both of which are structurally controlled.

The mesothermal gold occurrences can be divided into three subclasses: 1) auriferous quartz veins, of which there are five varieties, 2) altered wall rock (± quartz veins), and 3) disseminated gold. In the auriferous quartz-vein subclass, gold occurs within extensional or shear fracture veins, often associated with pyrite or arsenopyrite. Gold in the altered-wall-rock subclass occurs mainly within the deformed and altered wall rock adjacent to the quartz veins. In the disseminated subclass, the gold is associated with pervasive silicification and disseminated sulphides.

Epithermal-style mineralization and alteration are developed at a number of localities in central Newfoundland. These occurrences, in particular the Aztec prospect, exhibit argillic alteration, intensive and spectacular hydrothermal brecciation and pervasive silicification. Gold values associated with the epithermal occurrences are typically less than 3 g/t.

Many of the central Newfoundland mesothermal occurrences exhibit attributes such as brecciated quartz veins, vuggy quartz and comb textures, which suggest a shallower depth of formation possibly transitional between the typical mesothermal and epithermal settings. The extensive carbonate alteration associated with many of the occurrences, the presence of abundant CO_2-rich fluid inclusions within vein quartz, and stable isotope data, indicate that the mineralizing fluids were, in part, metamorphogenic in origin. These fluids could have been derived from either metamorphosed Exploits Subzone sequences, which are allochthonous upon rocks of the Gander Zone, or from the underlying metasediments of the Gander Zone. The gold occurrences are assumed to be Late Silurian to Early Devonian, based on their association with late regionally extensive structures and host rocks that in many cases are Siluro-Devonian.

INTRODUCTION

PURPOSE AND SCOPE

Gold exploration in Canada soared during the 1980s as a result of favourable prices and good investment opportunity. In Newfoundland, this exploration boom resulted in more than 400 gold discoveries (Tuach, 1992), many of which occur within central Newfoundland (Evans and Wilson, 1994). In response, the Geological Survey of the Newfoundland Department of Mines and Energy initiated a metallogenic study in 1989 aimed at documenting the nature and setting of this gold mineralization. The field aspect of this study (1989 to 1993) was restricted to gold occurrences within central Newfoundland that are located to the east of the Red Indian Line of Williams *et al.* (1988). The study area is referred to as the eastern and central Dunnage zones. This work involved regional geological mapping and deposit-level studies, which included mapping, structural studies, and diamond-drill core logging.

Preliminary results were presented earlier as a series of papers (Evans, 1991, 1992, 1993a; Churchill and Evans, 1992; Churchill *et al.*, 1993; Evans and Wilson, 1994; Tallman and Evans, 1994). A complete listing of project outputs is presented in Appendix 1. Significant results of this project include; 1) documentation of the numerous epigenetic gold occurrences, 2) a gold occurrence classification scheme, 3) documentation of the geological setting of gold mineralization in the eastern and central Dunnage Zone, 4) stable-isotope- and fluid-inclusion studies of selected gold occurrences, 5) detailed deposit-level studies in the form of M.Sc. theses projects (Duder Lake gold prospects; Churchill, 1994); Hunan Line antimony deposits (P. Tallman, personal communication, 1995), and 6) reconnaissance geological mapping (NTS 2E/2 west half; Evans *et al.*. 1992)

OVERVIEW

Structurally controlled, epigenetic gold occurrences in Newfoundland form a significant style of mineralization, the extent of which has only recently been recognized. Historically, gold production in Newfoundland was limited to an important by-product obtained from the mining of volcanogenic massive-sulphide deposits. Significant concentrations of gold were recovered from the Notre Dame Bay copper mines and from the Buchans and Rambler mining camps (approximately 30 tonnes, Tuach *et al.*, 1988).

In the late 1890s, a small amount of auriferous antimony mineralization was mined at Moreton's Harbour in eastern Notre Dame Bay. In 1903, the first true gold mine was opened at Sops Arm in White Bay (Snelgrove, 1935). This mine produced 149 ounces of gold from quartz veins before closing in that same year. The Sops Arm mine was followed, in 1904, by production from the Goldenville mine in Mings Bight. This mine operated sporadically for two years and produced 158 ounces of gold from quartz veins (Snelgrove, 1935).

The early 1930s saw a renewed interest in gold with exploration at a number of localities across the island (Snelgrove, 1935). At that time, the Newfoundland Department of Natural Resources decided to undertake an appraisal of the known gold occurrences. Field work was undertaken in 1934 by A.K. Snelgrove and the results of this study were published in 1935 (Snelgrove, 1935). Snelgrove's report, which is the only detailed regional study of Newfoundland gold occurrences, was widely referenced during the 1980s gold boom.

In 1976, significant vein-hosted, gold and base-metal sulphide mineralization was discovered at the Cape Ray prospect by prospector George Bayly. An extensive exploration program was undertaken by Riocanex Limited from 1977 to 1980 (Wilton and Strong, 1986) and by New Venture Equities Limited. Later, Dolphin Explorations Limited conducted detailed exploration and diamond drilling of the property during the late 1980s. Geological reserves within three separate zones total 0.886 million tons at 7.54 g/t (Tuach, 1992).

The discovery of the Hope Brook deposit in 1983 (McKenzie, 1986) established Newfoundland's position as a prime exploration area for gold. At its peak, gold exploration expenditure on the island amounted to greater than $40 million per year. By 1991, total exploration expenditures (combined gold and base metals) had dropped to less than $24 million (Mining in Canada, Facts and Figures, 1992).

Prior to 1978, there were approximately 25 mineral occurrences listed for the eastern Dunnage Zone, other than volcanogenic massive-sulphide deposits, which contained significant concentrations of gold. In 1978, auriferous quartz veins were discovered in gabbroic rocks of the Gander River Ultrabasic Belt (Blackwood, 1979, 1982) and this sparked the first real interest in the gold potential of the area. Since the mid-1980s, approximately 90 significant gold occurrences have been discovered in the eastern Dunnage Zone. Additional detailed historical information on gold mineralization in Newfoundland can be found in Snelgrove and Howse (1934), Snelgrove (1935) and Tuach *et al.* (1988).

REGIONAL GEOLOGY

The Island of Newfoundland forms the northern terminus of the Appalachian Orogen. Williams (1964) subdivided the island, based on stratigraphic and structural contrasts, into three geological zones. These zones, termed the Western platform, the Central Paleozoic Mobile Belt and the Avalon platform, are related to the formation and eventual destruction of a late Precambrian – early Paleozoic ocean known as Iapetus (Harland and Gayer, 1972). These divisions were subsequently revised into the Humber, Dunnage, Gander and Avalon tectonostratigraphic zones (Williams, 1979; Figure 1).

The Humber Zone, interpreted to represent the ancient continental margin of North America (Laurentia), comprises Paleozoic shelf-facies rocks deposited on crystalline Precambrian basement. Rocks of the Dunnage Zone consist of ophiolitic and volcanic, volcaniclastic and sedimentary rocks of island-arc and back-arc affinity that form the vestiges of the Iapetus Ocean. The Gander Zone comprises sedimentary rocks deposited at or near the eastern Iapetan continental margin (Gondwana) (Colman-Sadd, 1980; Blackwood, 1982), and the Avalon Zone comprises late Precambrian volcanic, sedimentary and plutonic rocks overlain by early Paleozoic platformal sedimentary rocks.

The Dunnage Zone has been further subdivided, on the basis of geochemical, metallogenic, geochronological, paleontological and geophysical parameters, into the Notre Dame and Exploits subzones (Williams *et al.*, 1988). These subzones are separated by an extensive fault system termed the Red Indian Line. It has been suggested that the two subzones were probably developed on opposing sides of the Iapetus Ocean (Neuman, 1984; Colman-Sadd *et al.*, 1992) and were not linked until the late Llanvirn–early Llandeilo.

The geological evolution of the Dunnage Zone can be subdivided into two broad stages: 1) pre- to syn-accretionary, and 2) post-accretionary (Swinden, 1990). The first stage consists of pre-accretion volcanism and pre- and syn-accretion sedimentation recorded in a series of Cambrian to Middle Ordovician island-arc and back-arc basins. During the late Arenig, initial closure of Iapetus resulted in the emplacement of Notre Dame Subzone rocks over the Laurentia continental margin (Taconic Orogeny, Stevens, 1970) and emplacement of the Exploits Subzone rocks over the Gondwana continental margin (Penobscot Orogeny, Colman-Sadd *et al.*, 1992).

Arc-related volcanism continued until at least the Llanvirn (Dunning *et al.*, 1987; Swinden *et al.*, 1988; O'Brien and Szybinski, 1989) with cessation of volcanism coinciding with the final emplacement of the Taconic allocthons during the Middle Ordovician (Kean and Strong, 1975; Swinden and Thorpe, 1984). Continued closure of Iapetus during the Late Ordovician and Early Silurian resulted in the deposition of flyschoid sequences in fault-bound basins in the central and eastern Dunnage Zone (Dean, 1978a; Kean *et al.*, 1981). Second-stage, post-accretion events were marked by the activation or re-activation of large strike-slip faults, the development of pull-apart basins (Szybinski *et al.*, 1990) and crustal melting resulting in epicontinental-style volcanism (Coyle and Strong, 1987), which led to the deposition of Silurian fluviatile sedimentary and terrestrial volcanic rocks. Siluro-Devonian deformation (termed the Salinic Orogeny by Dunning *et al.*, 1990) resulted in widespread crustal thickening, regional greenschist- and amphibolite-grade metamorphism, and caused crustal melting that resulted in widespread plutonism (Dean, 1978a; Strong, 1980; Colman-Sadd, 1980; Kean *et al.*, 1981; Dallmeyer *et al.*, 1983). Carboniferous faulting, probably related to the Alleghenian Orogeny, produced shallow pull-apart basins in which continental and shallow-water sediments were deposited (Dean, 1978a; Kean *et al.*, 1981).

GOLD OCCURRENCES, EASTERN AND CENTRAL DUNNAGE ZONES

All of the gold occurrences examined with the exception of those in the Moreton's Harbour area, are epigenetic and structurally controlled. Syngenetic gold associated with volcanogenic massive-sulphide deposits was not examined. Gold occurrences within the Moretons Harbour Group, which is located within the Notre Dame Subzone north of the Chanceport Fault on New World Island, are interpreted by Kay (1981) to be syngenetic and related to volcanism. These occurrences, which now number fourteen, represent a significant concentration of gold mineralization. Therefore, for completeness, brief descriptions of these occurrences are included in Appendix 2. Details on the genesis of the Moreton's Harbour occurrences can be found in Kay (1981).

Within central Newfoundland, the gold occurrences can be grouped into four regional zones: 1) Victoria Lake – Millertown, 2) Bay d'Espoir, 3) Great Bend – Pauls Pond, and 4) Glenwood – Notre Dame Bay (Figure 2). The occurrences in each zone are collectively discussed and classified according to the scheme developed by Evans (1993a). This classification scheme is outlined briefly below and is discussed in detail in the next section. A similar classification scheme was

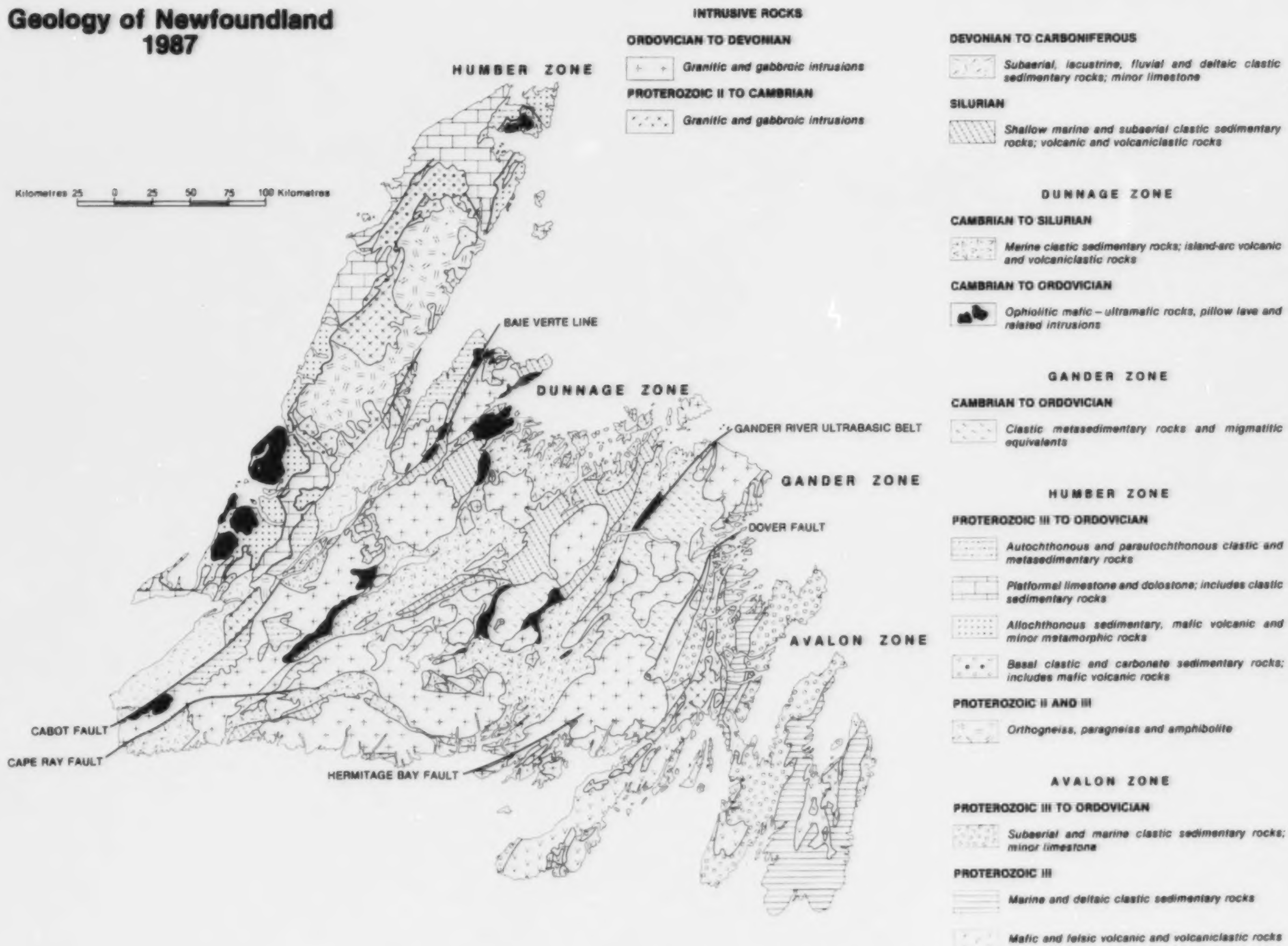


Figure 1. *Tectonostratigraphic map of Newfoundland (from Hayes, 1987).*

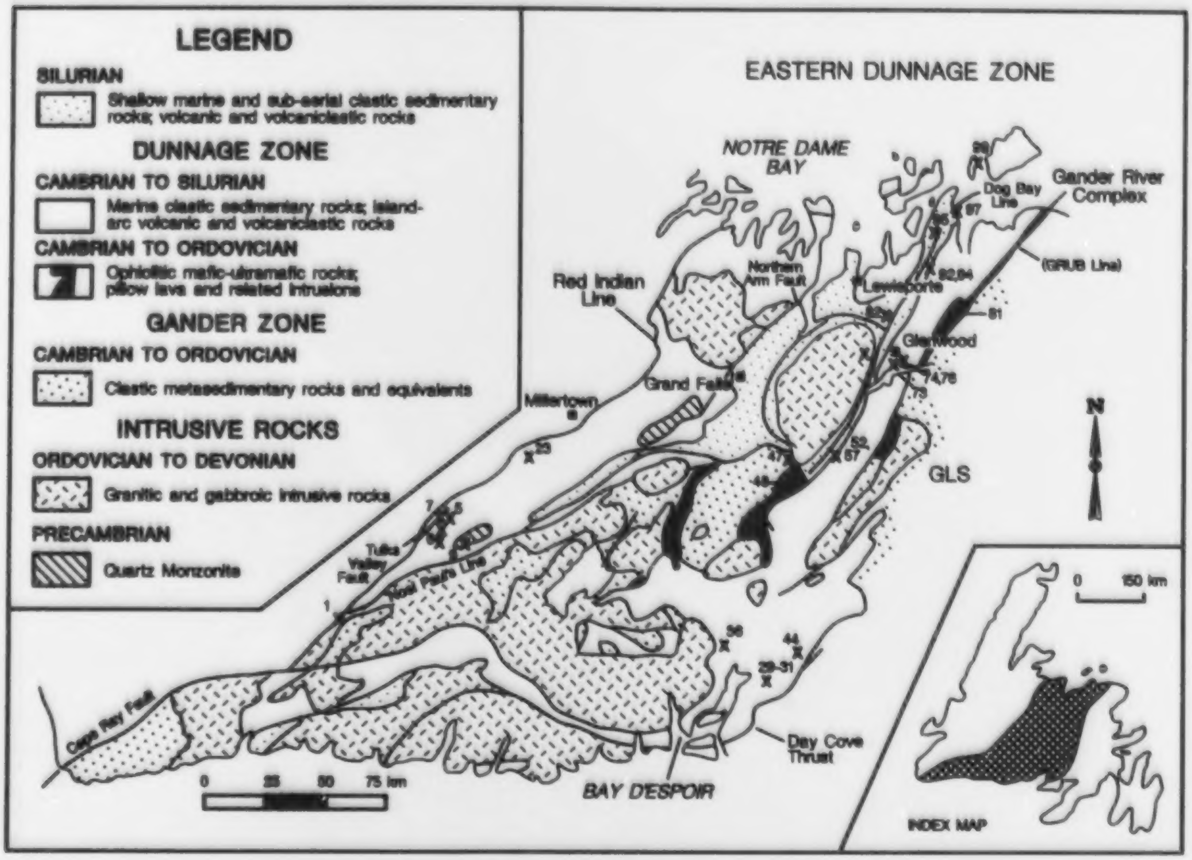


Figure 2. *Simplified geological map of central Newfoundland (modified after Evans and Wilson, 1994) showing the location of gold occurrences discussed in the text (numbers are keyed to the text). Abbreviations: BNG = Bay du Nord Gp., MS = Meelpaeg Subzone, BG = Baie d'Espoir Gp., VLG = Victoria Lake Gp., MCS = Mount Cormack Subzone, PPC = Pipestone Pond Complex, CPC = Coy Pond Complex, DG = Davidsville Gp., GBC = Great Bend Complex, BG = Botwood Group, GLS = Gander Lake Subzone, MPIS = Mount Peyton Intrusive Suite, WGB = Western Arm Gp. GRC = Gander River Complex, DM = Dunnage Melange, and GRUB = Gander River Ultrabasic Belt.*

proposed by Dubé (1990) for gold-only deposits in western Newfoundland.

Two broad classes or styles of gold mineralization have been identified within the eastern Dunnage Zone: 1) mesothermal, and 2) epithermal (Evans, 1991). Mesothermal mineralization occurs in both plutonic and sedimentary rocks of widely varying ages. This style of mineralization has been subdivided on the basis of mode of occurrence into three subclasses: 1) auriferous quartz veins; 2) altered wall rock ± auriferous quartz veins; and 3) disseminated gold. These subdivisions are not individually exclusive and exhibit some degree of overlap.

In the auriferous quartz-vein subclass, gold occurs either as inclusions, typically associated with pyrite or arsenopyrite, or as free gold. The veins form within extension fractures or shear fractures that developed in response to brittle ductile deformation. The quartz-vein subclass can be subdivided, based on gangue mineral content into; 1) pyrite-rich; 2) pyrite – arsenopyrite-rich; 3) base-metal sulphide-rich; 4) barite-rich; and 5) antimony-rich (Evans, 1993a). The base-metal-rich subclass may contain significant concentrations of silver.

The altered wall rock – quartz-vein subclass comprises structurally controlled gold mineralization developed in the altered wall rock adjacent quartz veins. Gold may also occur within the quartz veins. This terminology was adapted from Dubé (1990) who described a similar style of mineralization from western Newfoundland.

The disseminated style of mineralization results from fluid migration away from a fault/conduit into a permeable rock unit. The gold is typically associated with pervasive silicification and disseminated sulphide mineralization.

The following sections detail some of the more significant gold occurrences examined. Included are significant alteration zones that may or may not contain gold, and antimony occurrences that may be related to gold mineralization. Information on occurrences not covered in the text is provided in Appendix 2. For the location of occurrences mentioned here refer to Evans (1996); the number before the occurrence name is keyed to the map.

VICTORIA LAKE – MILLERTOWN AREA

Location and Access

The most significant gold occurrences within the Victoria Lake area (Figure 2) are located within the Victoria Lake (NTS 12A/6) map area. Lesser isolated showings occur on the King George IV Lake (NTS 12A/4), Snowshoe Pond (NTS 12A/7), Noel Paul's Brook (NTS 12A/9), Lake Ambrose (NTS 12A/10) and Star Lake (NTS 12A/11) map areas. Access to much of the area is provided by the numerous privately owned woods roads that originate at Millertown, Grand Falls and the Burgeo Highway (Route 480). The area is heavily forested with numerous intervening bogs and ponds. Barren and boggy areas are more common to the south. To the north, the topography consists of low rolling hills with isolated hills ranging up to 400 m. To the south, the topography is fairly rugged with deep glacial valleys and ridges ranging between 300 and 400 m above sea level. Extensive areas of glacial till result in generally poor bedrock exposure except along the linear, northeast-trending locally barren ridges.

Regional Setting

The regional geology of the Victoria Lake area can be described in terms of six main rock groupings (Figure 3): 1) Precambrian plutonic rocks of unknown affinity (i.e., the Valentine Lake and Crippleback Lake quartz monzonites; Evans *et al.*, 1990); 2) ophiolitic rocks of the King George IV Lake and Annieopsquotch complexes (Kean, 1983; Dunning, 1984), which are interpreted to form basement to the early Paleozoic island-arc and back-arc sequences; however, the contacts are faulted; 3) Cambrian to Middle Ordovician island-arc and back-arc volcanic, volcaniclastic and sedimentary rocks of the Victoria Lake (Kean, 1977; Evans *et al.*, 1990) and Bay Du Nord (Kean, 1983) groups and an unnamed sequence of rocks exposed to the southeast of the Victoria Lake Group (Kean, 1977; Colman-Sadd, 1988); 4) Middle Ordovician to Silurian flyschoid rocks that conformably overlie the early Paleozoic arc sequences (Kean *et al.*, 1981; Kean and Jayasinghe, 1982); 5) Silurian and Devonian sedimentary rocks, the Rogerson Lake Conglomerate (Kean and Jayasinghe, 1982) and the Windsor Point Group (Kean, 1983) respectively, which unconformably overlie the early Paleozoic sequences; and 6) Middle Ordovician to Silurian intrusive rocks, e.g., Lloyds River Intrusive Suite (Kean, 1983) and the Hungry Hill – Harpoon Hill gabbros (Kean and Jayasinghe, 1980).

Most of the economically significant gold occurrences occur within rocks of the Victoria Lake Group and the Valentine Lake quartz monzonite. The Victoria Lake Group is subdivided into two major lithofacies (Kean and Jayasinghe, 1980, 1982; Kean, 1985). These are; 1) two linear belts of predominantly felsic pyroclastic rocks having intercalated mafic flows, pillow lava, tuff, agglomerate and breccia (the Tulks Hill volcanics to the southwest and the Tally Pond volcanics to the southeast); and 2) a laterally equivalent, volcanic-derived belt of siliciclastic rocks in the northeast.

The Precambrian Valentine Lake quartz monzonite abuts the southeast margin of the Victoria Lake Group along a major northeast-trending linear (Figure 3). The pluton forms a differentiated sequence ranging from highly altered pyroxenite to gabbro and diorite to quartz monzonite (Kean, 1977).

Regional Deformation and Metamorphism

The Victoria Lake Group has a regional, inhomogeneously developed, penetrative foliation that is subparallel to bedding and axial planar to tight to isoclinal folds (Kean and Jayasinghe, 1980, 1982; Kean, 1985). This deformation increases in intensity to the southwest so that the Tulks Hill volcanics is more deformed than the Tally Pond volcanics.

Evans *et al.* (1990) indicated that the present distribution of geological elements within the Victoria Lake Group could be explained in terms of the southeastward-directed thrusting along northeast-trending faults. Reactivation of some of these structures as sinistral, transcurrent faults resulted in the flexuring and conjugate fault pattern observed within the Victoria Lake Group (Evans *et al.*, 1990). This interpretation is partially based on regional studies of infrared aerial photography, gradiometer data (Geological Survey of Canada, 1985a to e; Kean and Evans, 1988) and Synthetic Aperture Radar (C-SAR) imagery.

The rocks of the Victoria Lake Group have been regionally metamorphosed in the lower-greenschist facies, except locally along the group's southern margin where middle-greenschist to lower-amphibolite facies rocks are present.

The $^{40}Ar/^{39}Ar$ dating of sericite from massive-sulphide deposits and epithermal-style alteration (Kean and Evans, 1988) provided age dates ranging from 395 to 380 Ma. These

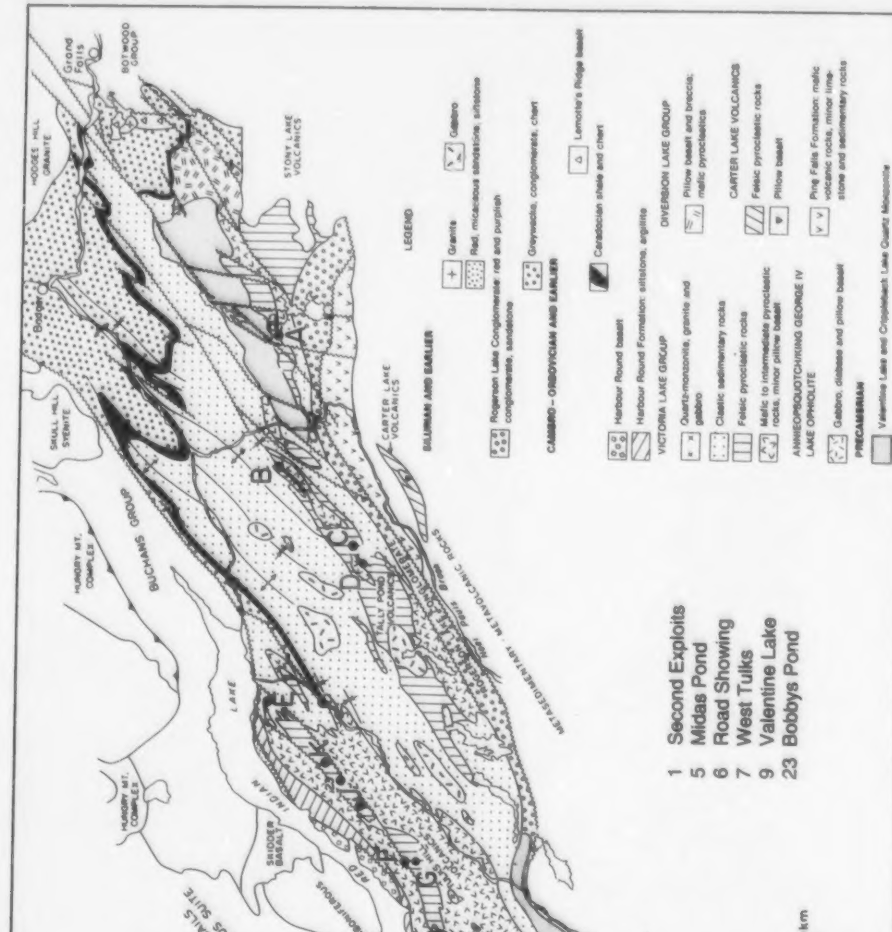


Figure 3. *Regional geology of the Victoria Lake area (from Evans* et al., *1990). Shown are the significant volcanogenic massive-sulphide deposits and the gold occurrences discussed in the text.*

dates indicate either the metamorphic cooling ages or the last movement along the northeast-trending linears.

The mode or time of emplacement of the Precambrian rocks is problematic. They are interpreted to have been structurally emplaced by the Silurian as they are nonconformably overlain by the Rogerson Lake Conglomerate. The Valentine Lake quartz monzonite appears to have been largely unaffected by regional metamorphism associated with either the Taconic or Salinic orogenies. Metamorphic minerals, monazite and titanite, obtained from the quartz monzonite, only provide evidence of Precambrian metamorphism (Evans *et al.*, 1990). The pluton is interpreted to have originated either as shallow crustal-level basement subsequently thrust into place or it was emplaced along transcurrent fault systems (Evans *et al.*, 1990).

Previous Work

The earliest recorded geological work in the Victoria Lake – Millertown area was undertaken by the Geological Survey of Newfoundland in 1871. Alexander Murray surveyed the Exploits River and reported the occurrence of sedimentary rocks along the river and of greenstones along Red Indian Lake (Murray, 1872). In 1875, J.P. Howley, accompanied by two Micmac guides, undertook geological mapping along the Exploits, Lloyds and Victoria rivers (Murray and Howley, 1881). In 1905, the Anglo Newfoundland Development Company Limited (ANDCo) was granted an exclusive 99 year lease for the timber, water and mineral rights to a 3742 km^2 area surrounding Red Indian and Victoria Lakes, known as the Terra Nova Properties (Neary, 1981). Prospecting surveys carried out in 1906 resulted in the discovery of the Buchans Deposit by Matty Mitchell, a Micmac Indian prospector and trapper. In 1907, William Scott, chief engineer with ANDCo, sent out prospecting parties to explore the area surrounding Buchans (Neary, 1981; Martin, 1983). This work resulted in the staking of the area known as the Victoria Mine. Captain Daniel McCuish was sent to the site with six miners, and on November 1 they began to sink two of three exploratory shafts. However, the mine proved to be uneconomic and work was halted.

In March 1926, the American Smelting and Refining Company (ASARCO) negotiated an agreement with the Terra Nova Properties Limited that gave ASARCO the right to explore for, and develop, any orebody within a 20 mile radius of Buchans (Neary, 1981). This agreement was eventually renegotiated to include a 30 mile radius for a period of 50 years. ASARCO conducted an extensive exploration program, which included sponsoring a number of university theses, over most of the Terra Nova Properties.

In 1934, Hans Lundberg Limited (Grimes-Graeme, 1934) conducted reconnaissance geological mapping and geophysical surveys of the area between Lloyds, Victoria and Long lakes. This work resulted in the discovery of significant mineralized float, consisting of fragments of quartz veins containing 36.0 oz/t Ag, 1.02 oz/t Au, 12.6 percent Zn and 7.5 percent Pb, in the Pats Pond area. Float containing stibnite and arsenopyrite was also discovered in the same area. Grimes-Graeme (1934) described the quartz veining developed throughout the study area:

> Quartz veins are abundant in this area and often attain considerable widths although their linear extents do not appear to be very great. However there seems to be a marked tendency for the veins to extend for considerable distances in an "en echelon" arrangement. A number of veins are mineralised, many of them containing pyrite and a little chalcopyrite. A few veins also contain fair amounts of galena in addition to pyrite, but the assays were disappointingly low in precious metal values. A characteristic of the veins is the presence of comb structures, ie., cavities lined with very perfect quartz crystals. This fact in conjunction with the physical form of the veins and their mineralogical association indicates that they originated at low temperatures and pressures at shallow depths in the earth's crust. Such a siagnosis is of value since it permits the prediction, within fairly narrow limits, of the type and form of mineralization which may be expected to occur within the district.

During the 1934 survey, reference was made to a concept that was to prove accurate almost sixty years later with the discovery of a number of significant gold prospects associated with regional linear structures (Kean and Evans, 1988; Evans *et al.*, 1990). Grimes-Graeme (1934) alluded to the intersection of two east – west-trending linears in the Long Lake area and indicated that such intersections were often favourable sites for ore deposition.

ASARCO, in following up an extensive gossan zone originally discovered in 1930 by W.E. Moore (Cooper, 1967), conducted geochemical stream sampling along Tulks Brook in 1961. This work, along with further surveys (1961 – 1962) and an extensive diamond-drilling program (1963 – 1966), resulted in the discovery of the Tulks Hill deposit.

On March 17, 1976, the Terra Nova Properties reverted to Abitibi-Price Incorporated when the 1926 agreement between the ANDCo. and ASARCO expired. Abitibi-Price continued exploration within the Victoria Lake Group and subsequently discovered the Tulks East deposit in 1977 and the Jacks Pond prospects in 1980 (Barbour and Thurlow,

1982). In 1985, the mineral rights to the Terra Nova Properties were purchased by BP Resources Canada Limited (BPCan). An extensive exploration program for gold and base-metal mineralization resulted in major finds at Midas Pond, West Tulks, Valentine Lake and Daniels Pond. BPCan suspended exploration activities in 1991 due to restructuring of the company.

Noranda Exploration Company Limited initiated a program of extensive geological mapping and geophysical surveys in the Tally Pond area in 1975. This work led to the discovery of the Boundary deposit in 1981 and the Duck Pond deposit in 1986. The company purchased the mineral rights to the Terra Nova Properties from BPCan in 1993 and is actively exploring the area, with a number of new massive-sulphide discoveries in the Long Lake and Tulks Valley areas.

The Millertown area was included in the Geological Survey of Canada regional mapping of the Red Indian Lake (NTS 12A) map area (Riley, 1957; Williams, 1970). Williams (1970) indicated that the volcanic and related sedimentary rocks outcropping to the south of Red Indian Lake were probably Ordovician.

Regional geological mapping of the area on a scale of 1:50 000 was begun by the Newfoundland Department of Mines and Energy in 1975 and continued until 1988. Geological maps and reports were completed for the following map areas: Victoria Lake NTS 12A/6 (Kean, 1977); Star Lake NTS 12A/11 east half (Kean, 1979a); Buchans NTS 12A/15 (Kean, 1979b); Lake Ambrose NTS 12A/10 (Kean and Jayasinghe, 1980; Evans and Kean, 1994a); Noel Pauls Brook NTS 12A/9 (Kean and Jayasinghe, 1980; Evans and Kean, 1994b); Grand Falls NTS 2D/13 (Kean and Mercer, 1981); Badger NTS 12A/16 (Kean and Jayasinghe, 1982; Evans and Kean, 1994c); King George IV Lake NTS 12A/4 (Kean, 1983); and Snowshoe Pond NTS 12A/7 (Colman-Sadd, 1988). Kean (1977) formally proposed the name Victoria Lake Group for the sequence of pre-Caradocian volcanic and sedimentary rocks lying to the south of Red Indian Lake.

The Terrain Sciences section of the Newfoundland Department of Mines and Energy initiated a program of quaternary mapping of the Central Mineral Belt in 1978 (Sparkes, 1985). Quaternary studies have also been conducted within the Buchans (NTS 12A/15) and Badger (NTS 12A/16) map areas by the Geological Survey of Canada (Klassen and Henderson, 1992).

The Victoria Lake Group was included in a regional lake-sediment geochemical survey conducted by the Newfoundland Department of Mines and Energy. Results of this study included the definition of the distributions of Au and associated pathfinder elements, such as As and Sb (Davenport *et al.*, 1990).

The Geological Survey of Canada has also conducted a regional aeromagnetic survey over much of the area underlain by the Victoria Lake Group (Geological Survey of Canada, 1985a to e). As well, the Geological Survey of Canada conducted an airborne gamma-ray spectrometric survey of the Tulks Hill volcanics in an attempt to define zones of potassic alteration associated with base- and precious-metal mineralization (Ford, 1991).

In 1984, the Newfoundland Department of Mines and Energy began a systematic study of the metallogeny of the Victoria Lake Group. The initial results of this work were covered in the following reports (Kean, 1985; Kean and Evans, 1986, 1988; Evans and Kean, 1986, 1987; Swinden *et al.*, 1989; Evans *et al.*, 1990; and Dunning *et al.*, 1991). Evans and Kean (1987) divided the mineralization within the Victoria Lake area into two main types: 1) syngenetic volcanogenic massive-sulphide, and 2) epigenetic gold mineralization. Included in this latter type is epithermal-style alteration. The massive-sulphide mineralization is interpreted to be related to arc-rifting processes. They indicated that the gold mineralization is: 1) restricted to the more deformed sections of the Victoria Lake Group, particularly within the Tulks Hill volcanics and along the southeast and northwest margins of the group, and 2) spatially related to regionally extensive linears that may represent deep-seated fault systems that acted as fluid conducts.

In the following text descriptions of gold occurrences, the number preceding each occurrence name is keyed to the numbers shown on Figure 2.

Gold Occurrences

1. Second Exploits

Location and Access

The Second Exploits showing (NTS 12A/04 Au001 UTM 428750 5327000) is located in the bed of the Second Exploits River, approximately 9 km south of King George IV Lake. The showing is located in a remote area and is best accessed by helicopter.

Exploration History

Mineralized veins described as galena-bearing stringers were first reported from the area as a result of prospecting for ANDCo (Harvey, 1930).

The Second Exploits area (Figure 4) was included in the 1:50 000-scale mapping of the King George IV Lake (NTS 12A/4) map area by the Newfoundland Department of Mines and Energy (Kean, 1983). During this mapping project, a boulder of altered granite with a section of mineralized quartz

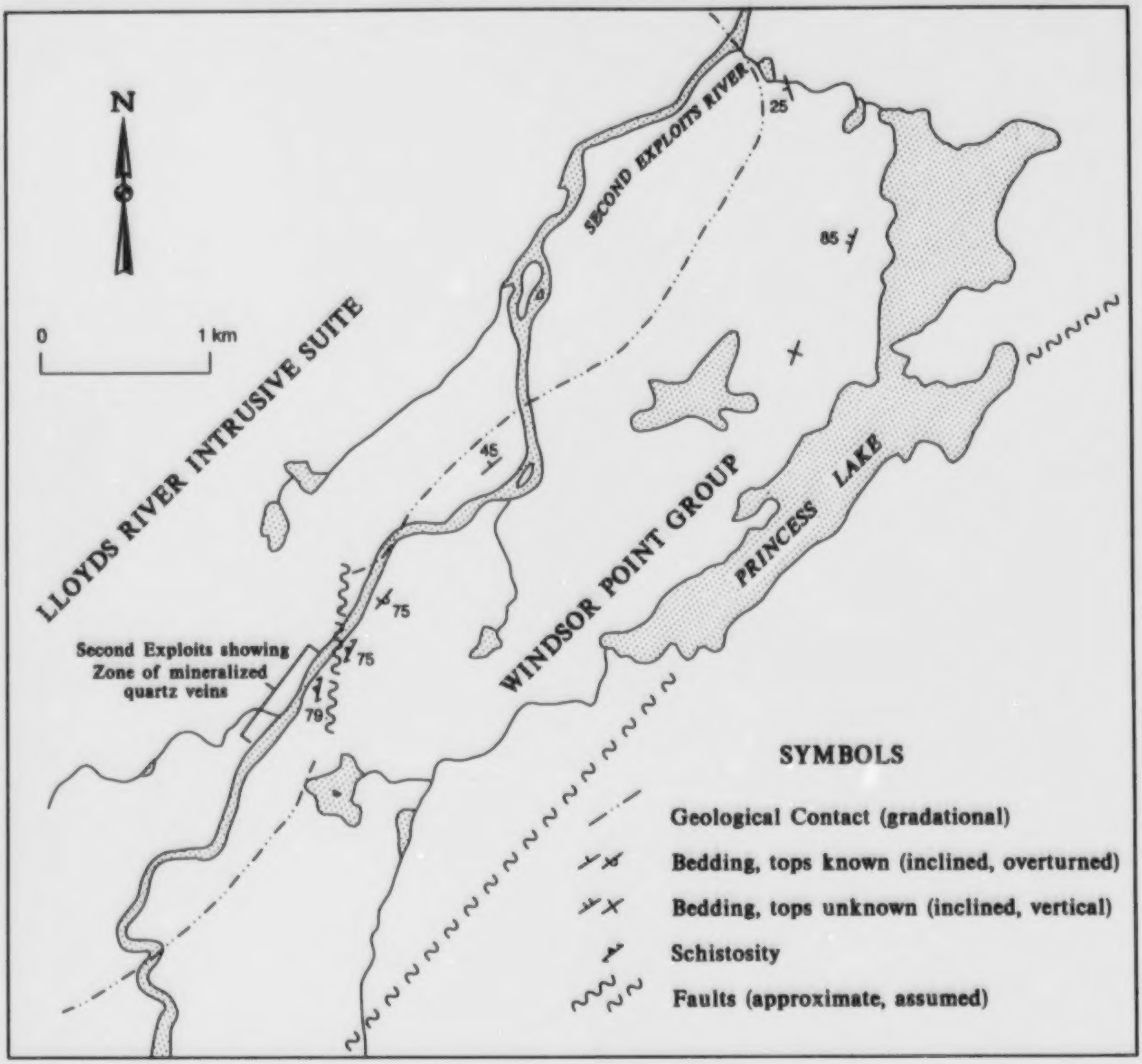


Figure 4. *Geology and location map of the Second Expoits showing (modified from Kean, 1983).*

vein containing visible gold, sphalerite, galena and pyrite was discovered in the stream bed of the Second Exploits River (Kean, *op. cit.*). The granite boulder was similar to the altered marginal phase of the Lloyds River Intrusive Suite exposed along the Second Exploits River; similar veins were subsequently discovered in outcrop.

Local Geology and Mineralization

Bedrock geology in the vicinity of the showing consists of coarse-grained, equigranular to K-feldspar porphyritic, hornblende – biotite granite of the Lloyds River Intrusive Suite. The granite is unconformably overlain by red sandstone and conglomerate of the Devonian Windsor Point Group (Kean, 1983).

The marginal phase of the Lloyds River Intrusive Suite is typically coarse-grained to megacrystic, grey to buff porphyritic granite containing pink to red K-feldspar (Kean, 1983). In the vicinity of the unconformity with the Windsor Point Group the granite is distinctively green due to sericitization and epidotization of plagioclase. Epidote veining, tuffisite breccias, quartz – carbonate veining and localized shearing also occur proximal to the unconformity. Alteration and veining appear to be restricted to the granite and were not observed in the overlying sedimentary rocks.

The contact between the granite and the Windsor Point Group is locally sheared. However, a section preserving the unconformity is exposed in the first waterfall northeast (downstream) of the mineralized quartz veins. Granite clasts are common in both conglomerate and sandstone units. No regional axial-planar fabric is developed in the rocks of the Windsor Point Group (Kean, 1983).

The mineralized quartz veins are exposed along a 500 m section of the Second Exploits showing. The veins are 1 to 5 cm wide, exhibit vuggy and comb textures and locally form small anastomosing networks (Plate 1). Coarse crystals and fine disseminations of sphalerite, galena, pyrite and minor specularite are present in most veins. Three vein orientations are present *viz.*, 15°/75°N, 80°/80°S and 190°/90°, and these appear to parallel jointing within the granite. Wall-rock margins to the veins are typically chloritic and are locally sheared. Visible gold has only been observed in quartz-vein float. Assay results from selected grab samples are presented in Table 1. The Second Exploits showing is classified as a base-metal-rich quartz-vein style of mineralization.

5. Midas Pond

Location and Access

The Midas Pond gold prospect (NTS 12A/06 Au001 UTM 476710 5365090) is located at the southwestern end of the Tulks Hill volcanics, approximately 15 km southwest of Red Indian Lake. A steep trail originating from the Tulks Valley woods road leads to the prospect.

Exploration History

The prospect was discovered by BP-Selco in 1985 as part of a re-evaluation of archived soil samples collected by ASARCO. To date, the prospect has been trenched and tested by 19 diamond-drill holes. The prospect was the subject of a M.Sc. thesis study by Evans (1993b).

Local Geology and Mineralization

The prospect is hosted by highly deformed and altered volcanic rocks of the Tulks Hill volcanics. It is localized within a northeast-trending (Plate 2), steeply northwest dipping, anastomosing, 200-m-wide brittle – ductile shear zone shear (Evans, 1993b; Figure 5). The shear zone is approximately parallel to the regional foliation and is interpreted to have formed during the regional D_1 deformation. D_2 deformation resulted in broad Z-shaped flexuring of the shear zone.

A subvertical zone of crosscutting auriferous quartz veins is developed near the contact between deformed mafic breccia (banded mafic unit) and structurally overlying felsic pyroclastic rocks (Figure 6). The banded mafic unit proximal to the quartz veining is siliceous and variably pyritized (2 to 5 percent). The pyritized section is slightly anomalous in gold. This alteration is also accompanied by an increase in the amount of carbonate and by an apparent decrease in epidote. This is interpreted by Evans (1993) to reflect the action of CO_2-rich fluids that appear to have been responsible for the deposition of the gold mineralization.

Plate 1. *Sphalerite – galena-bearing quartz vein within epidotized granite, Second Exploits showing.*

The felsic rocks have undergone intense argillic alteration and are essentially preserved as pyrophyllite – kaolinite – paragonite schists containing siliceous lenses (Plate 3); the argillic alteration is pervasive throughout the shear zone. However, it is more strongly developed in a 70-m-thick- by 700-m-long zone, which structurally overlies the quartz veining. Chlorite, fluorite, Fe-carbonate and pyrite occur locally within the zone.

Three generations of auriferous quartz veining (V_1, V_2 and V_3) are present. These veins are sporadically developed over a width of 10 to 15

Table 1. Assay results of selected grab samples collected from the Second Exploits showing

Sample	Rock Type	Au ppb	Ag g/t	Zn %	Pb %	Cu g/t
float*	quartz vein	25000	8	5.0	1.5	42
DE-85-157A	altered granite	10	0.1	na	na	na
DE-85-157B	altered granite	25	0.1	na	na	na
DE-85-157C	altered granite	20	0.1	na	na	na
DE-85-168A	quartz vein	3150	9.0	na	na	na
DE-85-170A	quartz vein	5500	33	na	na	na
DE-85-170B	quartz vein	255	11	na	na	na
DE-85-170C	quartz vein	< 5	4.4	na	na	na
DE-85-171A	quartz vein	2800	0.5	na	na	na

na - not analyzed * (average of 5 assays, Kean, 1983)

Plate 2. *Aerial view of Glitter Pond (foreground), Midas Pond (left of centre) and Tulks Valley. View to the north. The Midas Pond shear zone parallels the trend of Midas Pond.*

m and a strike length of approximately 800 m (Evans, 1993b; Figure 6). The earliest veins (V_1) are boudinaged C-shear veins developed parallel to the shear-zone fabric. These contain pyrite, carbonate, minor tourmaline and anomalous gold. The latest veins, V_2 and V_3, are extensional fracture veins that contain pyrite, ankerite, tourmaline, paragonite and gold (Plate 4). These veins are generally less than a metre thick, undeformed and form a conjugate set that trends 39° and 84°.

The V_2 and V_3 veins appear to be concentrated within the hinges of the D_2 flexures and are controlled by an S_2 fracture cleavage. This cleavage is interpreted to have formed during D_2 flexuring of the shear zone. The best gold values coincide with the noses of broad flexures where there appears to be a thickening of the quartz veining. This flexuring can be observed in the outline of both the shear zone and the banded mafic unit. The relationships between S_1 and V_1 veins, and S_2 and $V_2 - V_3$ veins at the Midas Pond prospect are illustrated in Figure 7.

Midas Pond is an example of a pyrite-rich quartz-vein style of mineralization. The gold is associated with pyrite (Plates 5 and 6) and the variations in the pyrite content of the quartz veins are reflected in the gold grades. Gold values are sporadic, the best results include 14.74 g/t Au from a 1.15-m-long channel sample and a diamond-drill intersection, that assays 7.3 g/t Au over 0.9 m (Table 2; Thurlow *et al.*, 1987; Barbour *et al.*, 1988). Gold enrichment in the host rocks (> 5 ppb) locally extends up to 20 m from the quartz veining.

6. Road (Camp) Showing

Location and Access

The Road (Camp) showing (NTS 12A/06 Au002 UTM 472150 5363210) is located in Tulks Valley approximately 18 km southwest of Red Indian Lake. It is exposed in a roadcut on the southeast side of the Tulks Valley woods road.

Exploration History

The showing was discovered by BPCan in 1986. At that time three short trenches were dug and grab samples were collected.

Local Geology and Mineralization

Cleaved sericitized and pyritized felsic crystal tuff of the Tulks Hill volcanics, Victoria Lake Group, host the showing. The pyrite is present as small (< 1 mm) disseminated cubes that appear to increase in abundance proximal to the veins.

The showing comprises a series of parallel, narrow (< 3 cm wide), quartz – carbonate veins that are restricted to small brittle structures developed at a high angle to the regional penetrative cleavage. The extent of the veining is unknown due to poor exposure. The veins contain coarse crystals of galena, sphalerite, and lesser amounts of pyrite and chalcopyrite (Plate 7). Grab sample assays range from 5.5 (Kean and Evans, 1988a) to 22.0 g/t Au (Thurlow *et al.*, 1987). The Road showing is classified as a base-metal-rich quartz-vein style of mineralization.

7. West Tulks

Location and Access

The West Tulks showing (NTS 12A/06 Au003 UTM 475290 5366910) is located on the western side of Tulks Valley approximately 14 km southwest of Red Indian Lake; the topography is rugged. However, the area can be reached by skidder trails that lead from Tulks Valley.

Exploration History

B-horizon soil sampling by Abitibi-Price in the West Tulks Pond area identified a number of significant gold anomalies (Thurlow and Barbour, 1985). Follow-up work by BPCan in 1987 resulted in the discovery of disseminated gold mineralization (Thurlow *et al.*, 1987); the showing has been trenched.

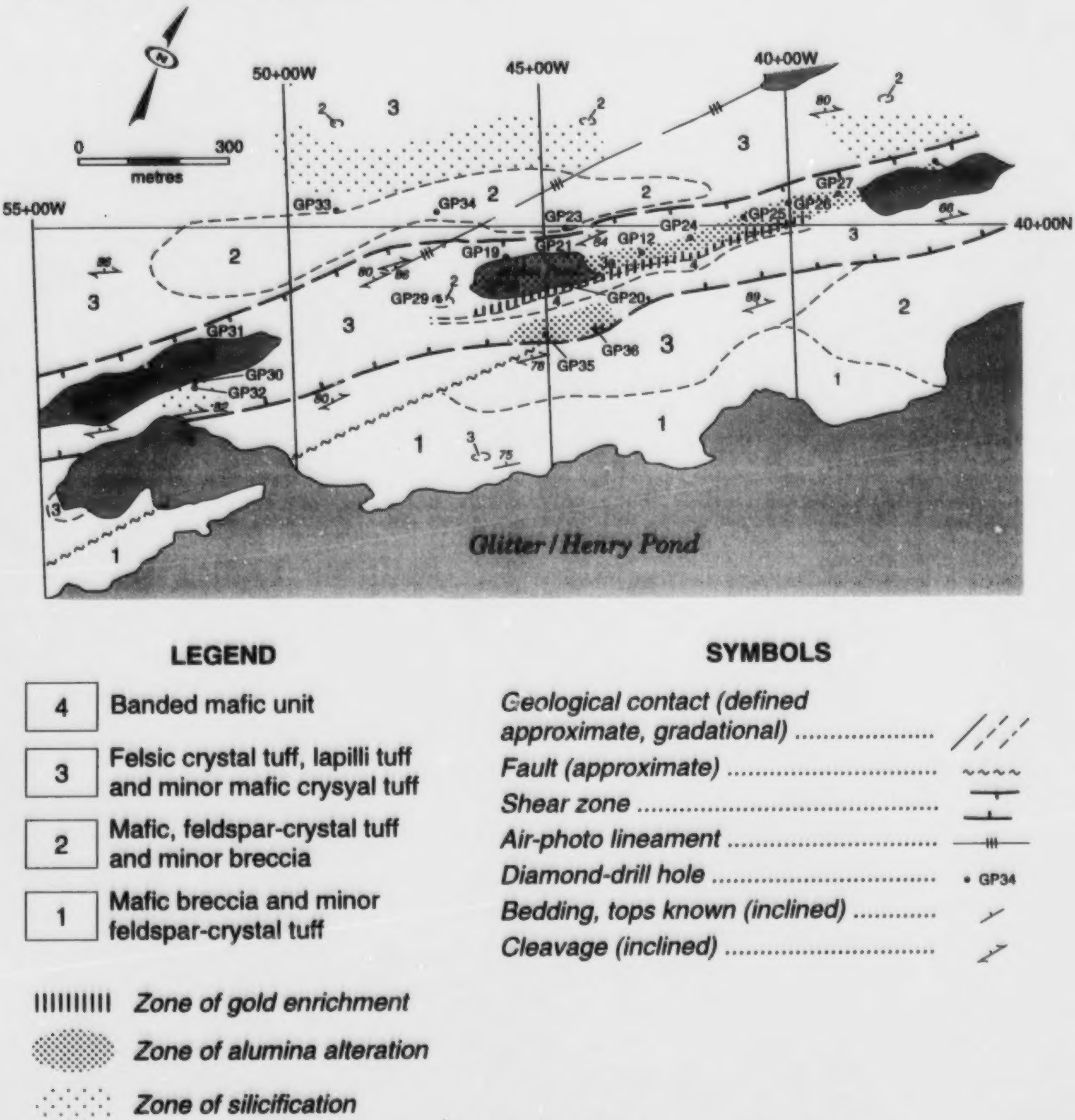


Figure 5. *Geology of the Midas Pond area (from Evans, 1993b).*

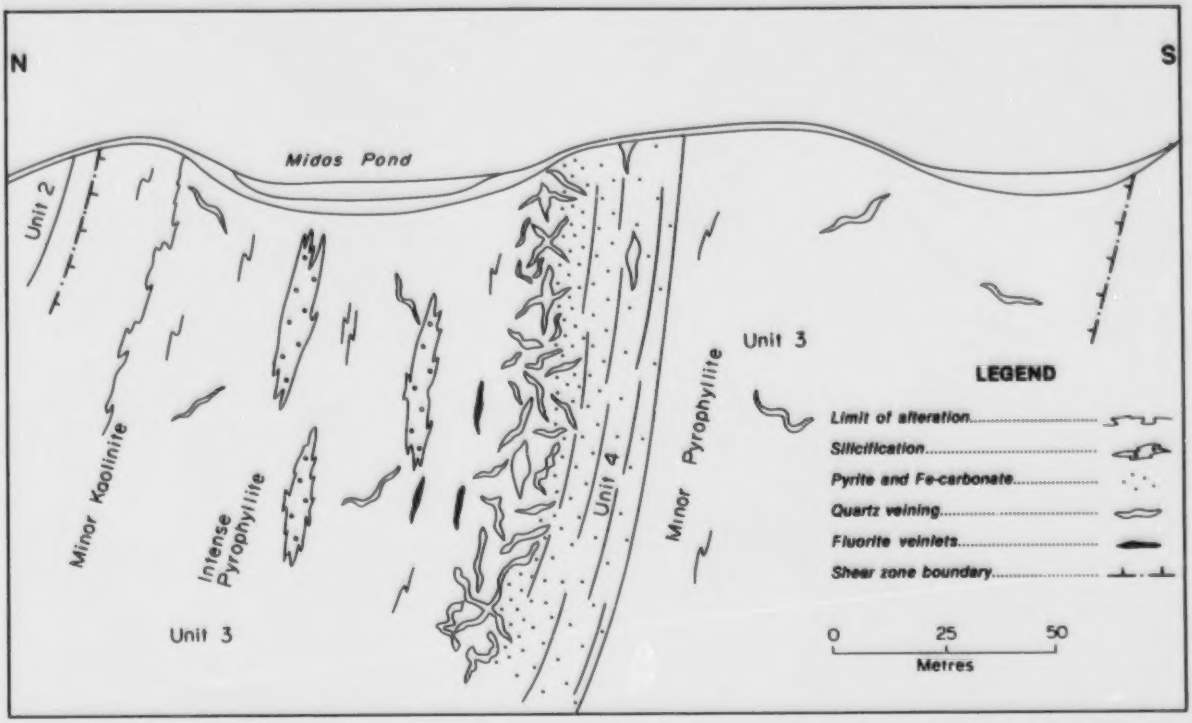


Figure 6. *Schematic cross-section showing the distribution of alteration assemblages and quartz veining at the Midas pond prospect (from Evans, 1993b).*

Plate 3. *Pyrophyllite – kaolinite-altered quartz-crystal tuff from the structural hanging wall, Midas Pond. The wispy dark bands are fluorite.*

Plate 4. *Auriferous quartz – pyrite vein within silicified mafic volcanic rocks; section assayed 7.3 g/t gold. The diamond-drill core is from the Midas Pond prospect.*

Local Geology and Mineralization

The West Tulks showing is hosted by intensely siliceous banded rocks that are included within the Tulks Hill volcanics (Plate 8). The rocks are described as either mylonitic felsic volcanic rocks, cherty sediments or a silica precipitate (Kean and Evans, 1988). They are fine grained, strongly banded, grey to white showing minor hematite staining.

No sulphide minerals are visible in grab samples collected from the showing and the nature of the gold mineralization is unknown. Samples of the siliceous banded rocks assayed up to 2 g/t Au (Thurlow *et al.*, 1987). Auriferous base-metal veins are also present locally, and a 2-m-wide zone of chlorite – sericite schist and quartz veining assayed 7.3 g/t Au (Thurlow *et al.*, 1987). The West Tulks showing is classified as a disseminated style of gold mineralization.

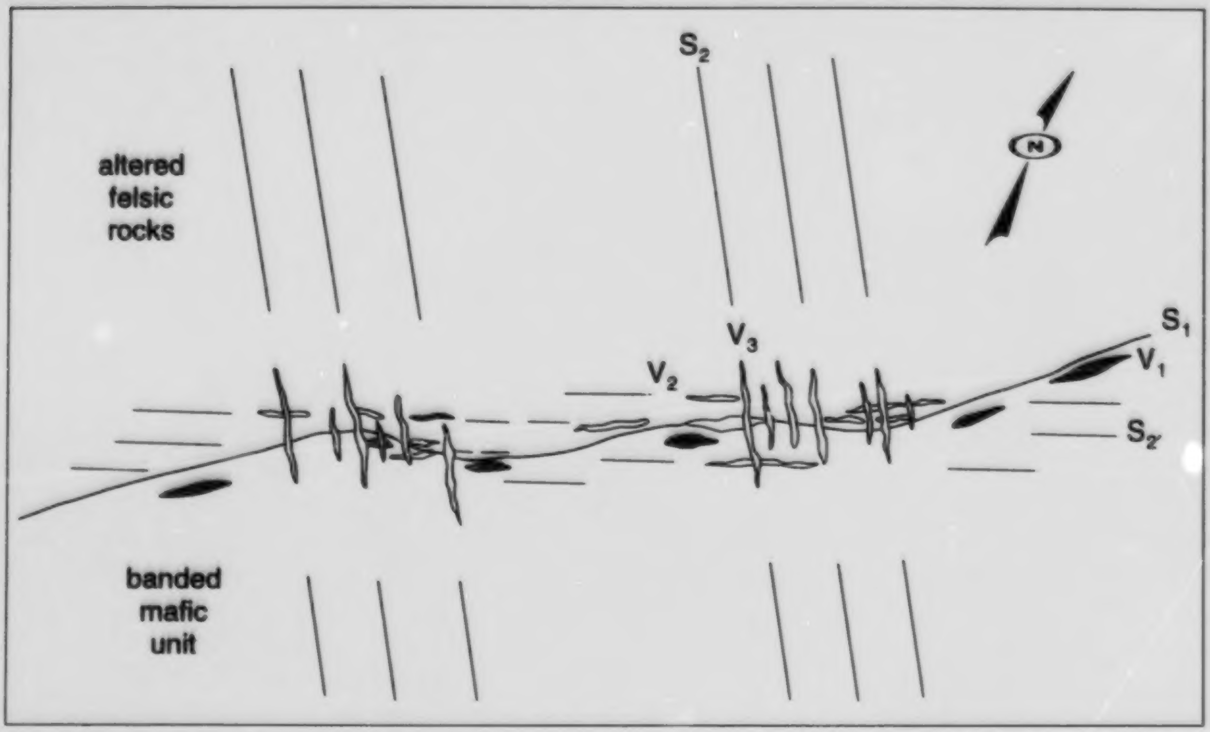


Figure 7. *Schematic diagram illustrating the relationships between the S_1 cleavage and V_1 veins, and the S_2 cleavage and V_2–V_3 veins at the Midas Pond prospect (from Evans, 1993b).*

9. Valentine Lake

Location and Access

The Valentine Lake prospect (NTS 12A/06 Au005 UTM 486230 5355620) is located approximately 5 km west of the main dam on Victoria Lake. A muskeg trail leads from the dam on Victoria Lake to the prospect.

Exploration History

The Valentine Lake prospect was discovered by BPCan in 1986 during a ground follow-up survey of anomalous gold values defined in reconnaissance B-horizon soil surveys (Barbour, 1990). Up to 1990, the prospect had been partially stripped and twenty-five diamond-drill holes had been drilled on the property.

Local Geology and Mineralization

Host rocks comprise fine- to medium-grained, equigranular to quartz porphyritic trondhjemite of the Valentine Lake intrusive suite (Barbour, 1990), and the Rogerson Lake Conglomerate that nonconformably overlies the trondhjemite (Figure 8). Barbour (1990) reported that both the trondhjemite and conglomerate were subjected to a single pre-Silurian transpressive event. This deformation produced a strong penetrative S-fabric associated with prominent flattening/stretching, northeast shearing, small-scale folding and overturning of the units so that the conglomerate now dips 60 to 70° to the northwest beneath the trondhjemite. The trondhjemite contains a pervasive network of fractures and quartz – tourmaline-coated slickensides that plunge steeply to the north-northeast. Movement within the trondhjemite was also accommodated along rare shear zones and fabric-parallel mafic dykes. Barbour (1990) reported that C – S fabrics and anticlockwise rotation of clasts within the conglomerate indicate a sinistral sense of shearing.

Alteration is confined to narrow zones (less than 20 cm) surrounding the quartz veins (Barbour, 1990) and consists of sericitization, albitization and zones of variable silicification that contain tourmaline and pyrite. The auriferous quartz veins are massive, locally banded, milky white and contain abundant tourmaline (Plate 9), 1 to 2 percent pyrite and minor scheelite, tungstite, pyrrhotite, arsenopyrite, base metals and bornite. The veins are typically 1 to 10 cm thick and less than 10 m long, but locally the veins are up to 1 m wide and have strike lengths of 50 m. They strike 120 to 130°, dip 40 to 50° southwest and are related to extensional fractures produced

Plate 5. *SEM backscatter photograph of gold telluride within a fracture in a pyrite grain. Sample is from the vein shown in Plate 4.*

during the main deformation event (Barbour, 1990). The most intense veining occurs within 500 m of the nonconformity. Localized concentrations of veining occur within the northeast-trending shears and along the contacts with the mafic dykes. Auriferous veining also occurs within the conglomerate but to a lesser extent (Barbour, 1990).

The Valentine Lake prospect is classified as a pyrite-rich quartz-vein style of mineralization. The gold generally occurs as submicron inclusions of elemental gold and gold telluride within pyrite (Plate 10; Barbour, 1990). Coarse gold appears to be restricted to the near surface and is attributed to supergene enrichment. Diamond-drill intersections indicated grades of up to 2 g/t over 22 m and 24 g/t over 3 m (Figure 9).

23. Bobbys Pond

Location and Access

The Bobbys Pond alteration zone (NTS 12A/10 S001 UTM 510520 5386900) is located approximately 6 km due east of Harbour Round, Red Indian Lake. The zone is developed parallel to, and about 1 to 2 km west, of Bobbys Pond. Logging roads originating at Millertown lead directly to the zone.

Plate 6. *SEM backscatter photograph of gold, intergrown with pyrite that rims an earlier pyrite grain, Midas Pond prospect.*

Table 2. Selected diamond-drill assay results from the Midas Pond prospect (data from Thurlow and Barbour, 1985)

Hole #	Interval (m)	Au (ppb)	Ag (ppm)
GP-85-20	5.2-6.7	20	0.1
	6.7-7.6	26	<0.1
	7.6-8.4	570	0.4
	8.4-9.1	1570	0.5
	9.1-10.4	2140	0.8
	10.4-11.9	840	0.5
	11.9-13.7	1237	0.8
	13.7-15.0	4590	2.6
	15.0-15.9	1210	0.8
	15.9-16.8	45	<0.1
GP-85-21	29.0-29.4	95	0.2
	29.4-29.7	2700	0.2
	29.7-30.2	1130	0.2
	30.2-30.8	940	0.2
	30.8-31.2	80	0.2
	31.2-31.7	480	0.2
	31.7-32.1	400	0.2
	32.1-32.4	7300	1.2
	32.4-33.0	195	0.2

Plate 7. *Sphalerite – galena-bearing quartz – carbonate vein within seriticitized and pyritized felsic crystal tuff, Road showing.*

Plate 8. *Siliceous banded rock, West Tulks showing.*

Exploration History

The alteration zone was located following the discovery by BPCan, in the fall of 1985, of boulders containing silica, sericite, pyrophyllite, alunite, native sulphur, orpiment and minor pyrite (Plate 11; Desnoyers, 1990). Exploration work conducted along the zone includes soil and basal till sampling, geological mapping, VLF-EM and magnetic surveys and a single diamond-drill hole.

Local Geology and Mineralization

Epithermal-style high-alumina alteration is developed at Bobbys Pond within sheared felsic pyroclastic rocks of the Tulks Hill volcanics. The alteration zone forms a northeast-trending linear belt that underlies a string of low-lying bogs and North Pond (Figure 10). Exposure is sparse but isolated outcrops comprise sheared, highly siliceous rocks (Plate 12; Desnoyers, 1990). Abundant disseminated and massive pods of pyrite are locally developed, particularly in areas of strong argillic alteration. A thin halo of chloritic alteration mantles the alteration zone (Desnoyers, 1990). Rocks outside the alteration zone are dominated by felsic tuff, felsic crystal tuff, felsic pyroclastic rocks and minor mafic rocks.

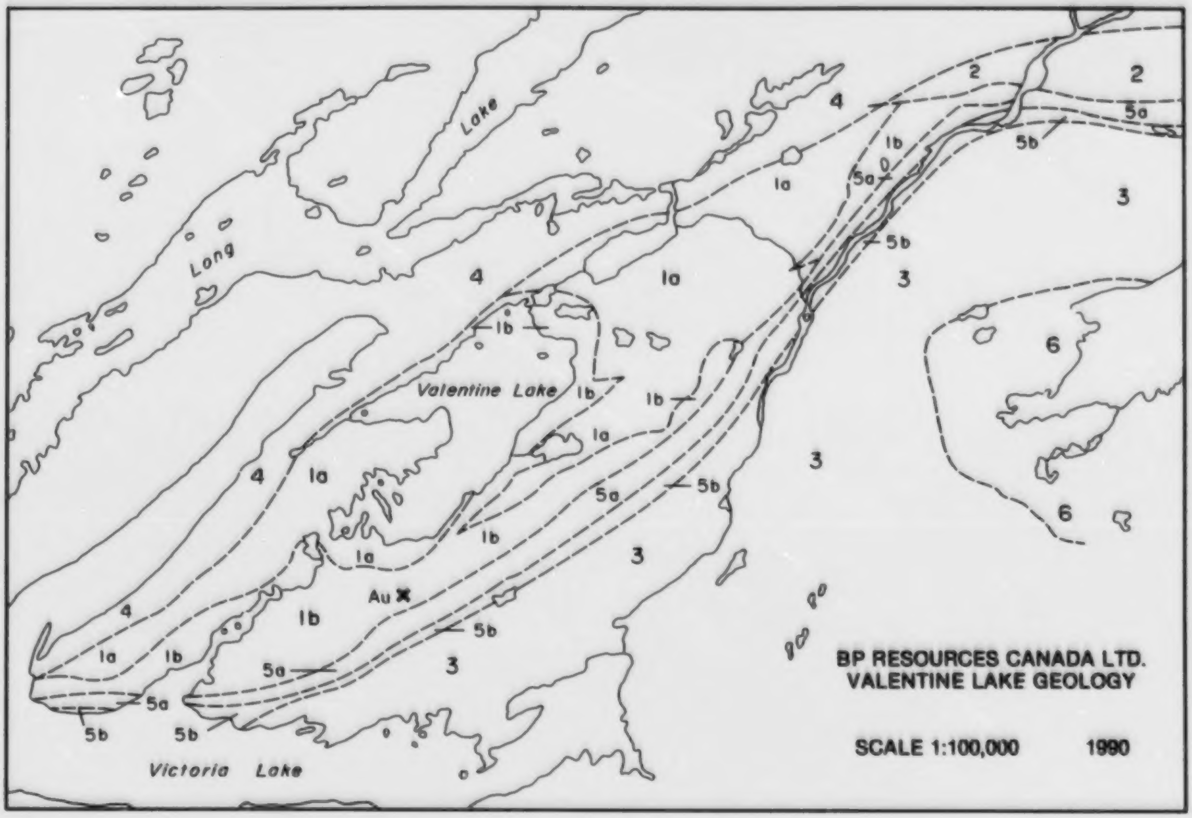
Gold assays from the altered rocks are typically less than 100 ppb (Desnoyers, 1990). Deformed, rusty, sericitic tuffs marginal to the alteration zone have returned assays of up to 156 ppb gold (Kean and Evans, 1988). Desnoyers (1990) reported that a few gold grains had been recovered from the heavy mineral fraction of till samples taken over the alteration zone. Economic concentrations of gold have thus far eluded exploration activities in the Bobbys Pond area.

The $^{40}Ar/^{39}Ar$ dating of sericite from one of the altered boulders at Bobbys Pond produced a plateau age of 392 ± 4 Ma (Kean and Evans, 1988). This would be a minimum age for the alteration and is interpreted to represent the metamorphic cooling age. Flow-banded (?) rhyolite (Kean and Jayasinghe, 1980), located to the northeast of the Bobbys Pond alteration zone, may either represent a change from subaqueous to subaerial volcanism within the Tulks Hill volcanics or are the product of Silurian volcanism. Such volcanic activity would favour the formation of epithermal systems. The style of alteration at Bobbys Pond is somewhat akin to the acid-sulphate type of epithermal deposit described by Heald *et al.* (1987). However, Evans *et al.* (1994) indicated that alteration similar to that of Bobbys Pond has been documented in a number of active sea-floor hydrothermal settings, particularly within rifted-arc environments (i.e., the Axial Seamount and the Central Okinawa Trough; Rona and Scott, 1993). Such alteration systems are locally associated with actively forming volcanogenic massive-sulphide mineralization.

BAY D'ESPOIR AREA

Location and Access

The gold occurrences examined within the Bay d'Espoir



ORDOVICIAN OR YOUNGER

5 Rogerson Lake Conglomerate
- *a) Conglomerate*
- *b) Siltstone, sandstone, minor conglomerate*

ORDOVICIAN?

4 *Undifferentiated siltstone, argillite and mafic volcanics*

3 *Intercalated, generally strongly sheared fine grained sediments, mafic volcanics and gabbroic intrusives*

INTRUSIVE ROCKS

DEVONIAN

6 Rodeross Mafic – Ultramafic Intrusion

ORDOVICIAN?

2 *Monzonite, quartz – monzonite*

PRECAMBRIAN/CAMBRIAN

1 Valentine Lake Intrusive Suite
- *a) Gabbro, diorite, pyroxenite*
- *b) Trondhjemite*

Figure 8. *Geological map of the Valentine Lake area (after Barbour, 1990).*

area (Figure 2) are all located within the St. Alban's (NTS 1M/13), Hungry Grove Pond (NTS 1M/14) and Mount Sylvester (NTS 2D/03) map areas. Access to the region is provided by the Bay d'Espoir – Harbour Breton Highway (Route 360) and numerous logging roads and trails. The more remote areas are accessible either by boat or all-terrane vehicle. Inland areas are generally relatively flat and covered by large expanses of open barren country and bog. In coastal areas, deep, steep-sided valleys, locally chocked with a stunted growth of spruce fir, are common. Glacial till is generally thick and bedrock exposure is limited.

Regional Setting

The regional geology of the area can be described in terms of four main rock groupings (Colman-Sadd and

Plate 9. *Weakly laminated quartz – tourmaline vein within quartz monzonite, Valentine Lake prospect. Tourmaline-coated slickensides are present in the upper right hand corner.*

Plate 10. *SEM backscatter photograph of gold, intergrown with pyrite, Valentine Lake prospect.*

Swinden, 1982; Figure 11): These are: 1) Precambrian (?) gneisses, psammites and pelites of the Gander Zone located to the east of the Day Cove Thrust; 2) ophiolitic rocks interpreted to form basement to the lower Paleozoic island-arc and back-arc sequences and preserved within the study area as a small fault-bound body of serpentinized peridotite and dunite (Dickson, 1987a); 3) Middle Ordovician and older sedimentary and volcanic rocks of the Baie d'Espoir Group; and 4) Silurian to Devonian intrusive rocks. For more detailed regional geological information the reader is referred to Colman-Sadd and Swinden (1982).

Gold mineralization within the Bay d'Espoir area appears to be confined to rocks of the Baie d'Espoir Group. The Baie d'Espoir Group (Anderson, 1967) extends from the Facheux Bay area, located on the south coast of Newfoundland, northeast to the Mount Sylvester area and includes portions of NTS map areas 11P/09, 1M/13, 1M/14, 2D/03 and 2D/04. The group is divided into four approximately time-equivalent formations that appear to represent facies changes from deep-water (turbiditic) sediments in the north, to shallower water sedimentary and volcanic rocks in the south (Colman-Sadd, 1976). These formations are from west to east: 1) Salmon River Dam Formation; 2) St. Josephs Cove Formation; 3) Riches Island Formation; and 4) Isle Galet Formation.

The Salmon River Dam Formation consists of sandstone, siltstone, graphitic schist and psammite. Significant gold mineralization has not been reported from this formation. The St. Josephs Cove Formation contains siltstone, pelite, sandstone, conglomerate and minor quartz – sericite schist, which is interpreted as felsic tuff. Three significant areas of mineralization occur within this formation: 1) the True Grit gold showing; 2) the Golden Grit gold showing; and 3) the Antimony Ridge showing (Pickett, 1993). A minor gold occurrence described by Winek (1954) is located at Rattling Brook. The Riches Island Formation consists of semipelitic schist, phyllite, psammite, graphitic schist, siltstone, pelite and felsic to intermediate volcanic rocks. The Long Jacks Bight showing is the only gold occurrence within this formation. The mineralization was documented by Winek (1954) but subsequent workers (e.g., Norman, 1985) have not been able to duplicate the assay results. The Isle Galet Formation consists of metamorphosed submarine clastic sedimentary, felsic and mafic volcanic rocks and is by far the most significant unit with respect to gold mineralization in the Bay d'Espoir area. The majority of these occurrences are located within the St. Albans map area (NTS 1M/13) and were discovered subsequent to 1985.

The Isle Galet Formation is divided into three distinct but mutually gradational volcanic facies (Colman-Sadd and Swinden, 1982) that are interpreted to represent variation in water depth and proximity to volcanic centres. These facies are termed western, central and eastern; the distribution of these facies is shown on Figure 11. Rocks of the western facies are interpreted to represent deposition in an environment distal from a rhyolitic volcanic centre. The central facies is interpreted to represent a more basinal environment distal to the volcanic centres. The eastern facies with its greater volume of volcanic rocks is interpreted to represent deposi-

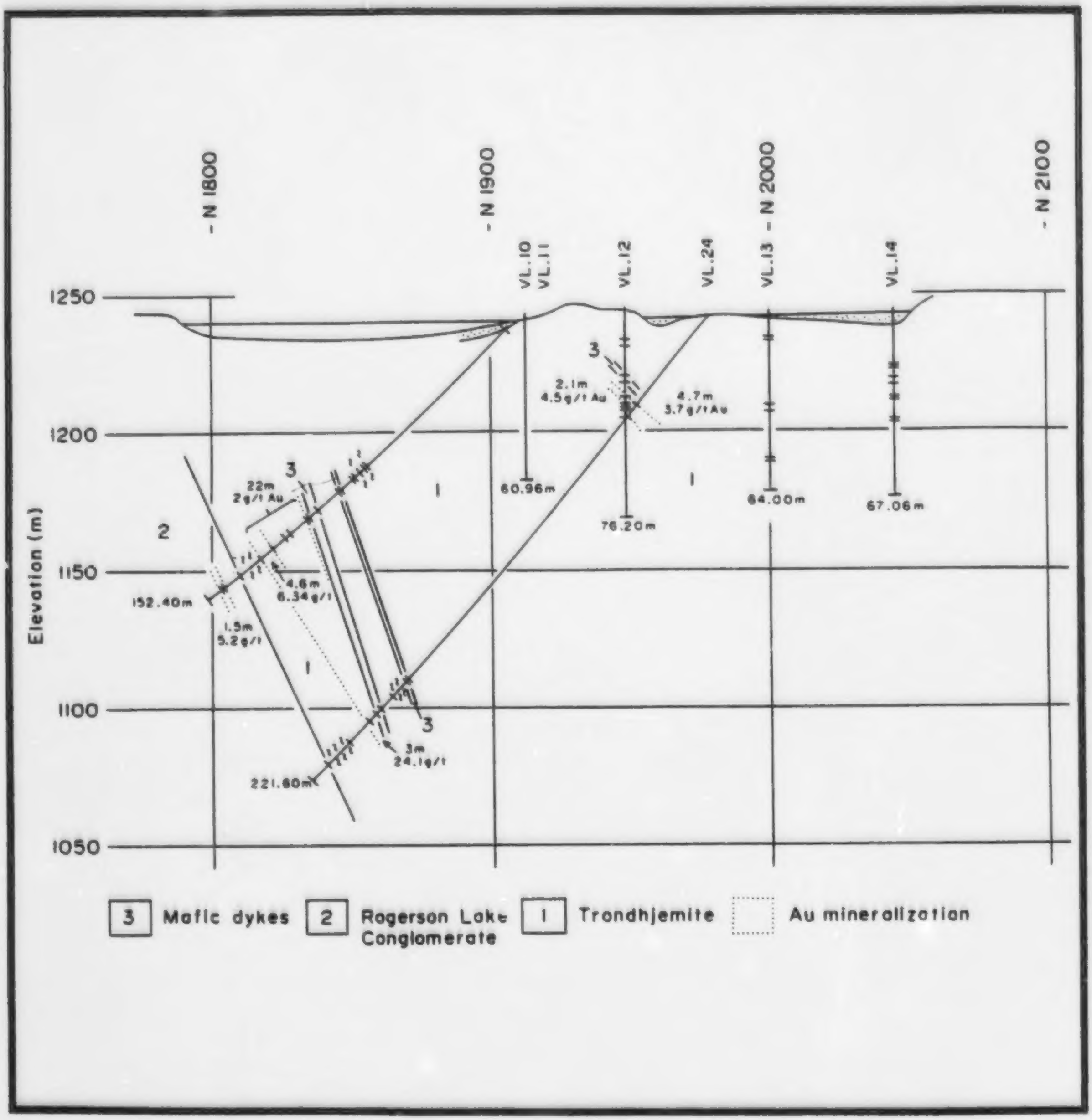


Figure 9. *Southwest-facing diamond-drill section, Valentine Lake (from Barbour, 1990).*

tion in a more proximal volcanic environment with explosive volcanic activity and shallower water sedimentation.

Regional Deformation and Metamorphism

Colman-Sadd (1976) reported evidence for two regional deformation events within the rocks of the Baie d'Espoir Group. The earliest deformation (D_1) produced isoclinal folding and a slaty cleavage, which has subsequently been converted through regional metamorphism into a schistosity.

Large-scale recumbent folds, asymmetrical toward the southeast, are the product of the second deformation (D_2). The folds become progressively tighter southward toward the Day

Plate 11. *Close-up of altered boulder, Bobbys Pond. The alteration consists of silica, sericite, alunite, wispy patches and stringers of native sulphur and orpiment (fine orange needles).*

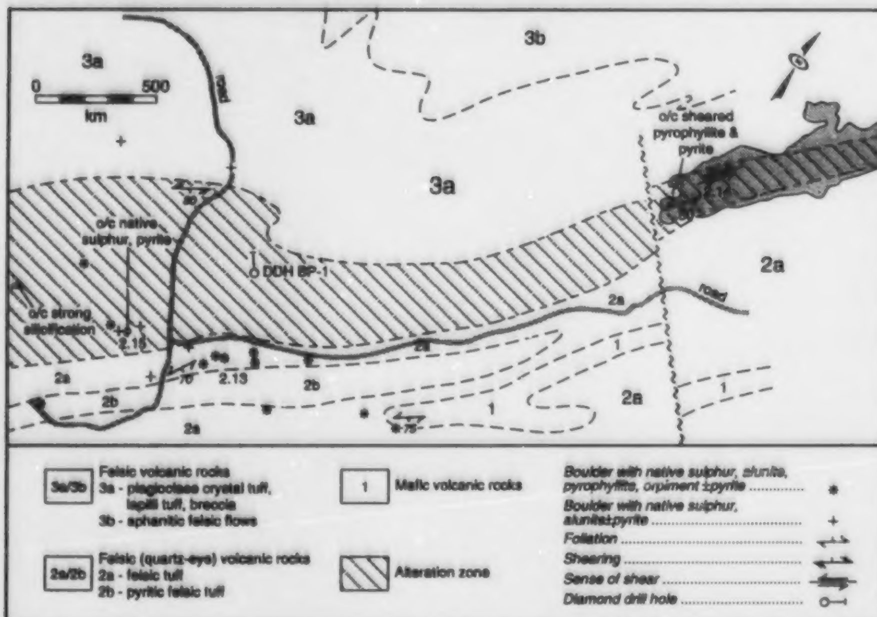


Figure 10. *Geological map of the Bobbys Pond area (from Desnoyers, 1990).*

Cove Thrust. A penetrative axial-planer fabric is associated with these folds. The Day Cove Thrust, which is interpreted to be associated with D_2 deformation, is marked by a zone of intense mylonitization and shearing several hundred metres wide. Movement along this thrust has effected rocks of the Isle Galet Formation up to 1 km from the fault (Colman-Sadd, 1976).

The rocks in the Baie d'Espoir Group have been metamorphosed to amphibolite facies (Colman-Sadd, 1976) and the metamorphic grade increases in intensity toward the southeast (Colman-Sadd and Swinden, 1982).

Previous Work

Previous work, both government and industry, within the Bay d'Espoir area are outlined in Table 3. A comprehensive review of the mineral occurrences of south-central Newfoundland has been presented by Colman-Sadd and Swinden (1982), who subdivided the mineral occurrences within the Bay d'Espoir area into volcanogenic stratabound sulphide and vein-type occurrences. They concluded that Zn – Cu – Pb and possibly Sb occurrences (Kim Lake #2) within the Baie d'Espoir Group, particularly within the Isle Galet Formation were related to a single, relatively widespread, volcanically driven mineralizing event. This was based on an apparent stratigraphic correlation between occurrences and a spatial association with felsic volcanic rocks. These occurrences were described as distal volcanogenic deposits formed by the transport, away from active volcanic centres, and subsequent deposition of sulphide minerals in reduced basinal sedimentary environments. Alternatively, Colman-Sadd and Swinden (1982) also suggest that hydrothermal fluids related to volcanogenic activity could have been channelled along faults or fractures zones into distal basinal areas.

Within the Bay d'Espoir area, the numerous vein-type occurrences were interpreted to be genetically related to the

Plate 12. *White, highly siliceous rock, Bobbys Pond alteration zone. The outcrop is cut by numerous wispy bands of native sulphur.*

North Bay Granite (Colman-Sadd and Swinden, 1982). Most of these occurrences are located within a 16-km-wide belt around the southeast margin of the granite within an area dominated by sedimentary rocks of the Baie d'Espoir Group. The occurrences exhibit a zonal distribution pattern with respect to the granite: a 4-km-wide marginal zone dominated by molybdenite; an inner base-metal bearing vein zone (galena, barite, sphalerite and arsenopyrite); and a peripheral zone containing rare stibnite-bearing veins.

The Bowers Tickle and Long Jacks Bight occurrences fall within the peripheral zone classification. Colman-Sadd and Swinden (1982) also suggested that the stibnite mineralization at the Kim Lake #2 prospect may be related to the emplacement of a granitic intrusion. This interpretation is supported by the work of Dickson (1987a) who described alteration and stibnite-coated joints developed within the Kim Lake Granite located along strike from the prospect.

Gold Occurrences

Little River

Westfield Minerals Limited began to explore the Little River area (Figure 12) in 1984 – 1985 as an extension of their Kim Lake exploration project. The company based their exploration model on the Chetwynd prospect (Hope Brook Deposit) because of similarities in the geological setting and rock type (McHale, 1985b). Westfield conducted extensive soil geochemical surveys, ground geophysics, geological mapping, trenching and diamond drilling over a four year period. This work outlined four significant mineralized horizons (McHale, 1985b; McHale and McKillen, 1987): 1) the Kim Lake horizon; 2) the Le Pouvoir horizon; 3) the Tillicum horizon; and 4) the Little River horizon. The Kim Lake horizon and mineralization is discussed in a later section. Mineralization associated with the Le Pouvoir horizon is discussed in Appendix 2.

The Tillicum and Little River horizons are dominated by felsic to intermediate tuffaceous rocks and lesser pelites and tuffaceous sediments. The Tillicum horizon has been traced from Wolf Pond to the southwest for a distance of 11 km. Trenching of soil gold-geochemical anomalies along the horizon have resulted in the discovery of gold mineralization at five localities. The Little River horizon is interpreted to lie 100 m stratigraphically above the Tillicum horizon. The horizon varies between 30 to 70 m thick and has been traced for approximately 27 km along strike (McHale and McKillen, 1988), extending from near Mine Point in the southwest to Big Spruce Pond in the northeast.

The Little River and Tillicum horizons are probably the most extensively mineralized parts of the Isle Galet Formation. Sporadic gold and/or antimony mineralization occurs along the entire length of both horizons. In 1985, gold was first discovered within the Little River horizon. Trenching a gold-geochemical anomaly (based on soil samples) located about 2 km southwest of Little Spruce Pond, uncovered auriferous disseminated sulphide mineralization (Little River #1, Au003). Continued exploration and trenching to the southwest in 1986 and 1987 resulted in the discovery of the Wolf Pond Zone (McHale and McKillen, 1987) and the 22 West zone respectively.

29-30. Wolf Pond

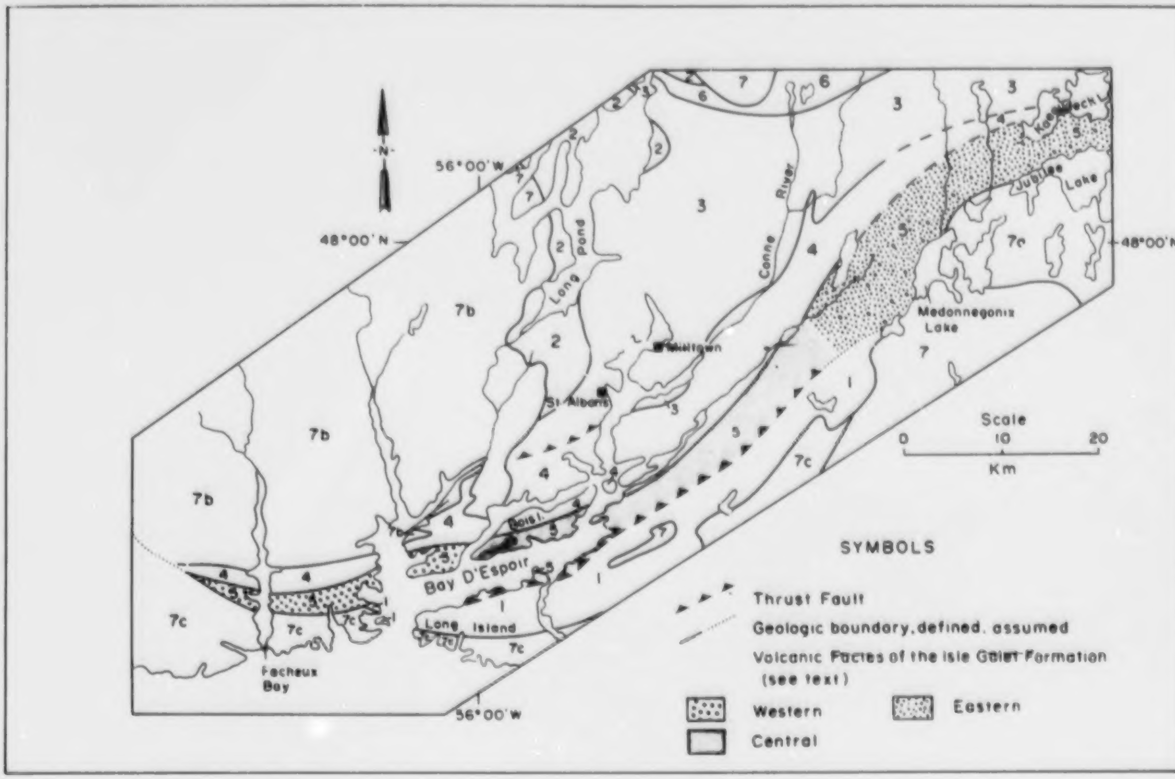
Location and Access

The Wolf Pond prospect (NTS 1M/13 Au007 UTM 607800 5308350 and Au008 UTM 607200 5307800) is located approximately 2 km east of where the Harbour Breton Highway (Route 360) crosses Little River (Figure 12). Muskeg trails lead to the area from the highway.

Exploration History

In 1986, Westfield Minerals excavated 22 trenches in the Wolf Pond area to test multi-element (Au, Sb, As) soil geochemistry anomalies along the Little River horizon. Four of these trenches exposed significant gold mineralization (Little River #5, Au007), associated with disseminated arsenopyrite, pyrite, pyrrhotite and antimony developed within extensively weathered volcanic rock (Table 4).

Westfield Minerals initiated a diamond-drill program in the fall of 1986 and early winter of 1987 (Figure 13). Nineteen diamond-drill holes, totalling 2216 m, were drilled to test the Wolf Pond Zone; results of this drilling are outlined in Table 5. Most of the drillholes intersected the mineralized zone. However, grades were not as encouraging as those



LEGEND

DEVONIAN (?)

7 **Granitoid Plutonic Rocks: 7a,** *Ackley Granite;* **7b,** *North Bay Granite and unseparated gneisses;* **7c,** *Gaultois Granite*

ORDOVICIAN

BAIE D'ESPOIR GROUP

6 **North Steady Pond Formation:** *Volcaniclastic, sedimentary rocks, minor felsic to mafic flows*

5 **Isle Galet Formation:** *Volcaniclastic and graphitic sedimentary rocks, 10-40% felsic volcanic rocks, minor mafic rocks*

4 **Riches Island Formation:** *Pelite and siltstone, lesser psammite*

3 **St. Josephs Cove Formation:** *Thinly bedded pelite and siltstone with minor thickly bedded sandstone*

2 **Salmon River Dam Formation:** *Bedded siltstone with thinly interbedded sandstone*

PRE-ORDOVICIAN

1 **Little Passage Gneisses**

Figure 11. *Regional geology of the Bay d'Espoir area (from Colman-Sadd and Swinden, 1982). Also shown are the volcanic facies of the Isle Galet Formation.*

Table 3. Listing of government and industry surveys in the Bay d'Espoir area

Reference	Area	Work (affiliation)
Murray and Howley (1881)	Bay d'Espoir to the headwaters of the Gander River	First to report the presence of quartz vein-hosted base-metal occurrences in the Bay d'Espoir area. (Geological Survey of Newfoundland)
Howse (1936)	Barasway de Cerf prospect and Little River area	First written description of the exploration trenches. (Geological Survey of Newfoundland)
Jewell (1939)	Bay d'Espoir area	Mapped the area around Bay d'Espoir and named the metasedimentary and metavolcanic rocks the Baie d'Espoir Series. Also described styles of vein mineralization within the area and provided descriptions of the mineral occurrences at Barasway de Cerf and Little River. (Geological Survey of Newfoundland)
Matthew, Ambrose Wilcott (in Jewell, 1939)	Little River area (Long Jacks Bight and Bowers Tickle showings)	Claims staked by W.J. Walters of Toronto and undertook trenching and sampling.
Baird *et al.* (1951)	Area between Hamilton Sound, Notre Dame Bay and Bay d' Espoir	Reconnaissance geological mapping. (The Photographic Survey Corporation)
Moore (1953)	Area between Conne River and Kaegudeck Lake	Mapped the southeastern edge of the Bay d'Espoir Group and was the first to recognize felsic volcanic rocks within the group. (Geological Survey of Newfoundland)
Dunlop (1954)	Bay d'Espoir area	Geological mapping of the Bay d'Espoir area. (NALCO Newfoundland and Labrador Corporation Limited)
Meikle (1954)	Southern edge of the Baie d'Espoir Group between Little Passage and Matt Lake	Geological mapping and prospecting. First report of significant Au mineralization (12.0 g/t) from quartz veins. However, due to the nature of the veining the mineralization was considered to be uneconomic. (NALCO)
Winek (1954)	The contact area of the Baie d'Espoir Group and the North Bay Granite between Long Pond and Northwest Cove	Geological mapping and prospecting. Discovered a number of molybdenite occurrences including the Rattling Brook showing which assayed 0.19 oz/t Au. (NALCO)
Berrangé and McCabe (1955)	Area between Kaegudeck and Medonnegonix lakes	Geological mapping, discovered base metal mineralization (Kim Lake #1) within the Isle Galet Formation. (NALCO)
Wall (1956a)	Kim Lake area	Detailed geological mapping which resulted in the discovery of the Kim Lake #2 prospect (misidentified Sb mineralization as galena). (NALCO)
Wall (1956b)	Medonnegonix Lake, Western Pond and Maxwell Pond areas south of Kim Lake	Regional geological mapping and prospecting. (NALCO)
McPhar Geophysics (1956)	Kim Lake	Conducted vertical loop EM surveys at Kim Lake #'s 1 and 2. The results indicated the presence of a weak conductor at Kim Lake #2. (NALCO)
Lebans (1956)	Kim Lake	Soil survey at Kim Lake #1, reported sporadic high values. (NALCO)
NALCO (1962)	St. Alban's and Hungry Grove map areas	Aeromagnetic survey by Hunting Survey Corporation.
Anderson (1965)	Belleoram 1:250 000 map area	Conducted regional geological mapping for the Geological Survey of Canada.
GSC (1969)	St. Alban's map area	Aeromagnetic survey flown by the Geological Survey of Canada.
Colman-Sadd (1974)	Bay d'Espoir area	Ph.D. thesis on the geological development of the Bay d'Espoir area.
Colman-Sadd (1976)	St. Alban's map area	Produced 1:50 000 geological base map (NTS 1M/13). (Newfoundland Department of Mines and Energy)
Saunders and Prince (1977); Hinchey (1978)	Isle Galet Formation from Facheux Bay to Medonnegonix Lake	Falconbridge Nickel Mines Limited optioned a portion of the NALCO concession in 1975 and conducted geological mapping in 1976, airborne EM and follow up mapping in 1977.
Dean (1978b); Aerodat (1979); Chance (1979); Fenton (1981a and b)	Mount Sylvester, Hungry Grove Pond and St. Albans map areas	Hudson's Bay Oil and Gas optioned a portion of the NALCO concession in 1977 and conducted detailed geological mapping, geochemical and geophysical surveys and limited diamond drilling, including detailed work on the Kim Lake #2 prospect. The option was dropped in 1982.

Table 3. Continued

Reference	Area	Work (affiliation)
Butler and Davenport (1978); Butler (1985)	Belleoram map area	Regional lake-sediment geochemistry survey, sample density approximately one sample per 6 km^2. (Newfoundland Department of Mines and Energy)
Colman-Sadd (1980)	Twillick Brook map area	Produced 1:50 000 geological base map (NTS 2D/4) (Newfoundland Department of Mines and Energy)
Swinden (1980a and b)	Hermitage Flexure area	Metallogenic study of the Hermitage Flexure area (Newfoundland Department of Mines and Energy)
Swinden and Dickson (1981)	Mt. Sylvester map area	Compiled 1:50 000 geological base map (NTS 2D/3) (Newfoundland Department of Mines and Energy)
Colman-Sadd and Swinden (1982)	South central Newfoundland	Reviewed the geology and mineral potential of the area (Newfoundland Department of Mines and Energy)
1984 NALCO concessions revert to Crown Land status		
Butler (1985)	Bay du Nord River	Detailed stream-sediment survey to test Zn amd Pb anomalies identified from the Department of Mines and Energy regional lake sediment survey, 1977-1978
Murphy (1985); McHale (1985a and b); McHale and McKillen (1987, 1988, 1989a and b)	Isle Galet Formation (Kim Lake, Le Pouvoir and Little River areas)	Extensive area staked by Tillicum Resources Limited for Westfield Minerals Limited and Anglo-Dominion Gold Exploration Limited. Detailed exploration work and diamond drilling outlined four auriferous horizons: 1) Kim Lake, 2) Le Pouvoir, 3) Little River, and 4) Tillicum. (See text for detailed account of exploration activities)
Norman (1985); French (1987)	St. Alban's and Little River areas	Geological mapping and geochemical sampling (Labrador Mining and Exploration Company Limited)
Dickson (1986, 1987a)	Mt. Sylvester	Produced 1:50 000 geological base map (NTS 2D/03) and report (Newfoundland Department of Mines and Energy)
Huard (1987a and b)	Little River area	Geological mapping and geochemical sampling in the vicinity of the Long Jacks Bight and Bowers Tickle showings. (Noranda Exploration Company Limited)
O'Donnell (1987)	Little River area	Geochemical sampling of the Long Jacks Bight and Bowers Tickle showings. (Granges Exploration Limited)
Lenters (1987)	Southeast Pond and Collins Brook areas	Geological mapping, prospecting and geochemical sampling within the Riches Island and Isle Galet formations as a follow-up to regional stream-sediment sampling and reconnaissance geological and prospecting surveys conducted in 1985. (Esso Minerals Canada)
Dickson (1987b, 1988)	Hungry Grove Pond area	Produced 1:50 000 geological base map (NTS 1M/14) and report (Newfoundland Department of Mines and Energy)
McBride and Barnes (1988)	Head of Bay d'Espoir and Little River areas	Geochemical exploration. (Exmar Resources Limited and J. Lundrigan) (Cuvier Mines Limited)
Pickett (1990a, 1991)	Milltown area	Geological mapping, geochemical and geophysical surveys and trenching. (See text for detailed account of exploration activities).

obtained from the trenches. McHale and McKillen (1987) indicated that the extensive weathering observed in the trenches may have produced a secondary enrichment of gold and this could account for the lower grade drill intersections.

A second phase of drilling consisting of 18 holes, totalling 2021.04 m, was undertaken at Wolf Pond in 1988 (Figure 13). Three holes, 88-16, 86-18 and 86-19, intersected significant gold and antimony mineralization (McHale and McKillen, 1989a; Table 5). The remainder of the drilling tested the strike potential of the zone to the southwest. Anomalous gold values were intersected in most of the drillholes.

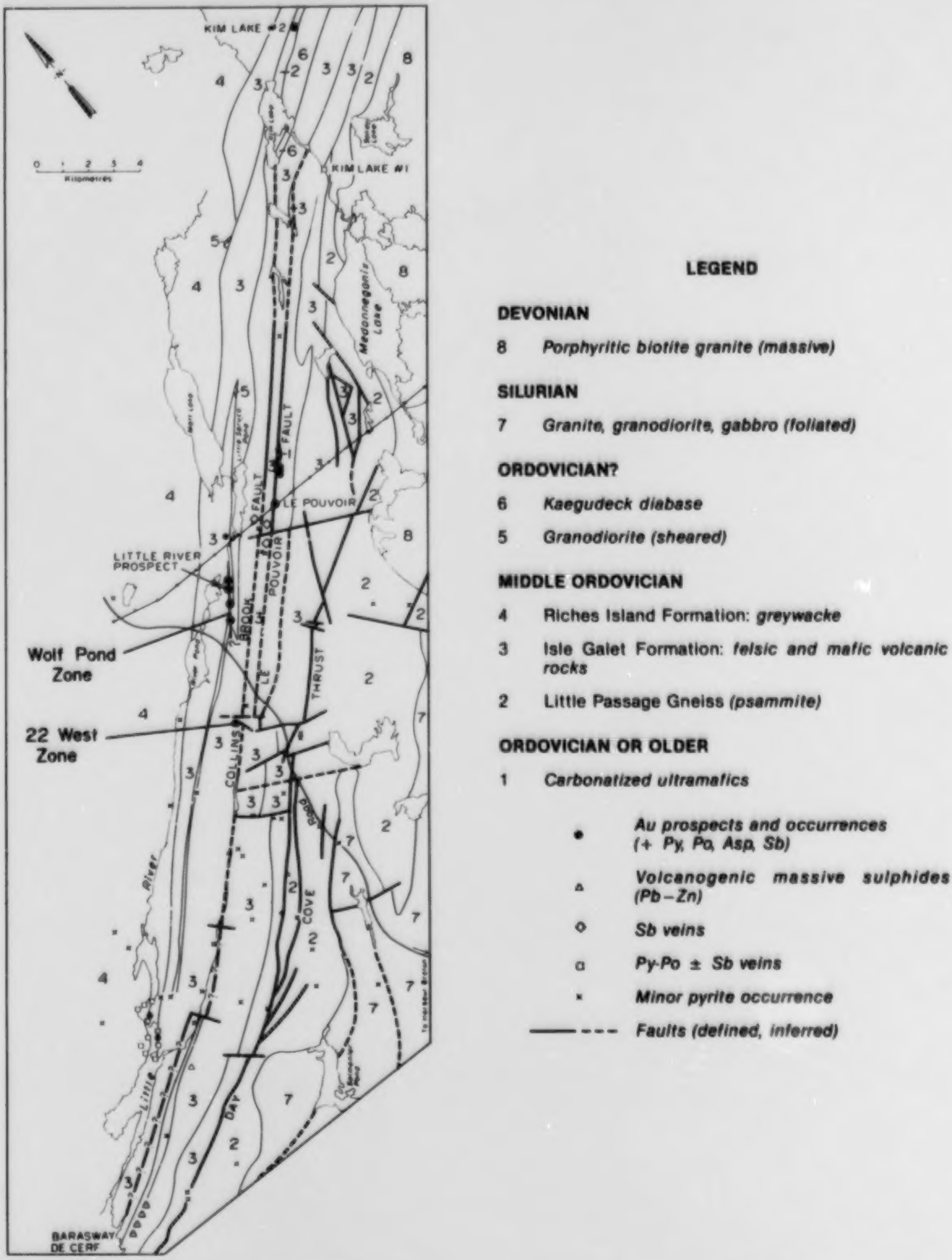


Figure 12. *Simplified geology and significant mineral occurrences in the Little River area (modified from Dickson, 1988).*

Table 4. Selected trench assay results, Wolf Pond Zone (from McHale and McKillen, 1987)

Trench	Interval (m)	Au (oz/t)
86-1	2.0	0.115
86-12	1.5	0.186
86-14	1.5	0.153
86-20	3.5	0.171

Local Geology and Mineralization

The gold mineralization is hosted by strongly deformed fine-grained intermediate to felsic tuff. Minor pelitic and tuffaceous sedimentary rocks are also present. Thin bands or intercalations of light grey calcareous tuff or tuffaceous sedimentary rocks occur throughout the horizon (McHale and McKillen, 1987).

The Wolf Pond Zone, as outlined by diamond drilling and trenching, is between 1 and 7 m thick, has been traced for 166 m along strike and tested downdip to a depth of 55 m (McHale and McKillen, 1988). The zone has a potential strike length of approximately 450 m. The higher grade auriferous zones are mantled by a halo up to 30 to 40 m thick, which contains anomalous concentrations of gold (>10 ppb; Figure 14).

Two distinct styles of mineralization are present within the Wolf Pond Zone (McHale and McKillen, 1987); they are 1) disseminated sulphides associated with carbonate alteration; and 2) antimony-bearing quartz veins, fractures and foliation – parallel bands. Both styles appear to be localized near the upper and lower margins of the Little River horizon. The disseminated style of mineralization is the most significant. It consists of disseminated arsenopyrite laths ± fine-grained pyrrhotite, pyrite and antimony.

The arsenopyrite occurs as randomly oriented, euhedral laths up to 5 mm long. Arsenopyrite-bearing, siliceous alteration haloes locally mantle the widely developed quartz – carbonate veins and veinlets. Within the disseminated mineralized zones the tuffaceous rocks are strongly foliated, variably carbonitized and vary from grey to greenish grey to black (Plate 13).

The antimony – quartz-vein style of mineralization appears to be ubiquitous throughout the Wolf Pond Zone. However, it is more prevalent within the disseminated mineralized zones. The veins range from millimetre-scale fractures up to veins in excess of 50 cm thick. The antimony occurs as semi-massive, metallic-grey clusters and patches within massive milky-white quartz and as fine-grained, bronze-coloured irregular masses within fractures (Plate 14). The antimony minerals identified include stibnite (Sb_2S_3), gudmundite (FeSbS), berthierite ($FeSb_2S_4$), and the secondary

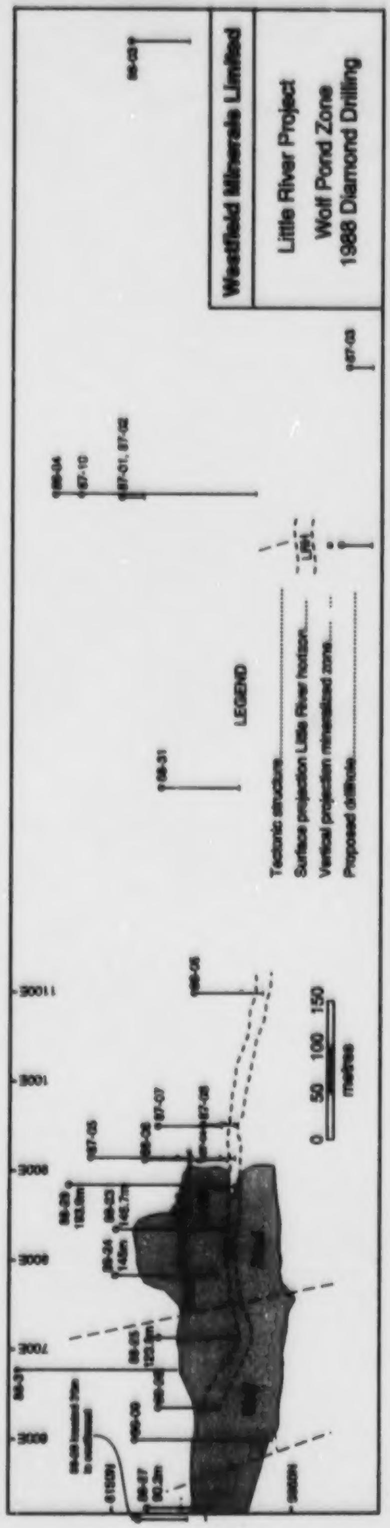


Figure 13. *Selected diamond-drill hole locations, Wolf Pond prospect (after McHale and McKillen, 1987, 1989a).*

Table 5. Assay results from selected diamond-drill holes (drilled between 1986 and 1988), Wolf Pond Zone (McHale and McKillen, 1987, 1989a).

Hole #	Interval (m)	Au (ppb)	As (ppm)	Sb (ppm)
86-01	68.50-71.50	2023		
86-03	20.00-22.00	1919		
	31.50-32.50	1250		
	40.50-43.50	1467		
	52.00-53.00	1290		
86-04	281.00-282.00	1825		
86-05	71.50-73.00	1587		
86-06	82.5-83.0	6600		
	83.0-83.5	7600		
	83.5-84.0	3550	8920	6150
	84.0-84.5	228	275	4245
	84.5-85.0	100	625	155
	85.0-85.5	235	410	115
	85.5-86.0	400	1795	3300
	86.0-86.5	9500	>10 000	>10 000
	86.5-87.0	170	550	300
	87.1-87.6	340	3350	9380
	87.6-88.0	385	1495	7710
	94.5-95.0	1750		
	95.0-95.5	1050		
	100.0-100.5	1050		
87-01	10.5-10.7	2450	>10 000	20
	10.7-11.2	4200	>10 000	28
	11.2-11.7	1700	>10 000	25
	11.7-12.2	680	1670	10
	12.2-12.7	3880	>10 000	220
	12.7-13.2	2600	9560	10
	13.2-13.7	315	645	5
87-02	11.0-11.5	1450	>10 000	15
	11.5-12.0	15	565	5
	12.0-12.5	2350	>10 000	30
	12.5-13.0	435	2020	5
	13.0-13.5	340	2280	5
	13.5-14.0	2650	7620	645
	14.0-14.5	5500	>10 000	1105
	14.5-15.0	180	365	15
87-03	5.5-6.1	3000	>10 000	170
	8.1-8.6	1000	3510	25
	12.7-13.2	1480	9090	45
	13.2-13.7	595	3080	15
87-04	23.9-24.4	645	na	na
	24.4-24.9	4780	na	na
	24.9-25.9	8550	na	na
	25.9-26.4	4200	na	na
	26.4-26.9	2750	na	na
	26.9-27.4	1400	na	na
	27.4-27.9	920	>10 000	>10 000
	27.9-28.5	1450	>10 000	>10 000
	28.5-29.0	1380	>10 000	>10 000
	29.0-29.5	660	5640	>10 000
	29.5-30.0	440	4520	>10 000
	30.0-30.5	30	190	8030
87-06	26.9-27.4	460	3040	2130
	27.4-27.9	3350	1560	3.00%
	27.9-28.7	350	610	2.77%
	28.7-29.0	4530	1285	12.0%
	29.0-29.5	200	355	0.52%
	29.5-30.0	200	120	125
	30.0-30.5	65	670	7470
	30.5-31.0	1700	8350	2.82%
	31.0-31.5	685	5340	6.05%
	31.5-32.0	3450	>10 000	1.84%
	32.0-32.5	1200	>10 000	3.43%
	32.5-33.0	325	920	4.64%
87-07	67.8-68.2	1450	3920	700
	72.2-72.7	700	340	805
	72.7-73.1	5700	>10 000	8790
	73.1-73.8	5050	>10 000	5260
	73.8-74.1	1000	1790	195
87-08	63.5-64.0	25	NA	NA
	64.0-64.5	5350	>10 000	2720
	64.5-65.0	315	1345	195
	65.0-65.2	4430	>10 000	4430
	65.2-65.6	630	3040	825
87-09	22.9-23.4	120	340	455
	23.4-23.9	1230	1585	>10 000
	23.9-24.4	4130	>10 000	5450
	24.4-24.9	3950	>10 000	7060
	24.9-25.4	5950	>10 000	5070
	25.4-25.9	1330	>10 000	6100
	25.9-26.4	520	4310	495
	26.4-26.9	590	7540	2650
	26.9-27.4	1200	5540	1515
	27.4-27.9	280	>10 000	4340
	27.9-28.4	465	2190	120
	28.4-29.0	1830	>10 000	1625
	29.0-29.3	1430	9700	185
	29.3-29.5	1430	9210	185
	29.5-30.0	9800	>10 000	165
	30.0-30.6	3200	>10 000	1040
	30.6-31.1	600	4100	1140
88-16	41.3-41.8	140	na	na
	41.8-42.3	0.023 oz/t	5500	1.5%
	42.3-42.8	0.013 oz/t	3700	3.3%
	42.8-43.1	0.022 oz/t	1600	2900
	68.2-568.7	0.012 oz/t	02%	0.2
	68.7-69.2	0.19 oz/t	2.2%	2.3%
	69.2-69.7	0.059 oz/t	1.0%	0.7%
	69.7-70.2	0.19 oz/t	2.2%	1.1%
	70.2-70.7	0.075 oz/t	1.4%	0.8%
	70.7-71.2	0.053 oz/t	0.9%	<0.1%
	71.2-71.5	0.13 oz/t	1.5%	0.7%
	71.5-72.5	190	na	na
88-18	27.4-27.9	2850	0.10%	0.011%
	27.9-28.4	2650	1.60%	0.075%
	28.4-28.9	1900	1.50%	0.15%
	34.7-35.2	135	na	na
	35.2-35.7	5400	1.30%	001%
	35.7-36.2	2150	0.76%	0.057%
	36.2-36.7	2450	0.87%	0.12%
	36.7-37.2	3350	1.00%	0.12%
	37.2-37.7	5300	2.30%	1.30%
	37.7-38.3	490	na	na
	44.6-45.1	0.051 oz/t	6200	3300
88-19	42.1-42.6	1650	na	na
	42.6-43.1	4400	na	na
	43.1-43.8	600	na	na
	43.8-44.4	3800	na	na
	44.4-45.4	210	na	na
	45.4-46.4	1360	na	na
	46.4-47.5	415	na	na
	47.5-48.0	0.024 oz/t	0.3%	<0.1%
	48.0-48.5	0.062 oz/t	1.6%	<0.1%
	48.5-49.0	0.04 oz/t	1.1%	6.0%
	49.0-49.5	0.073 oz/t	1.6	1.5%
	49.5-50.0	0.027 oz/t	0.3%	0.7%

na–Not analyzed

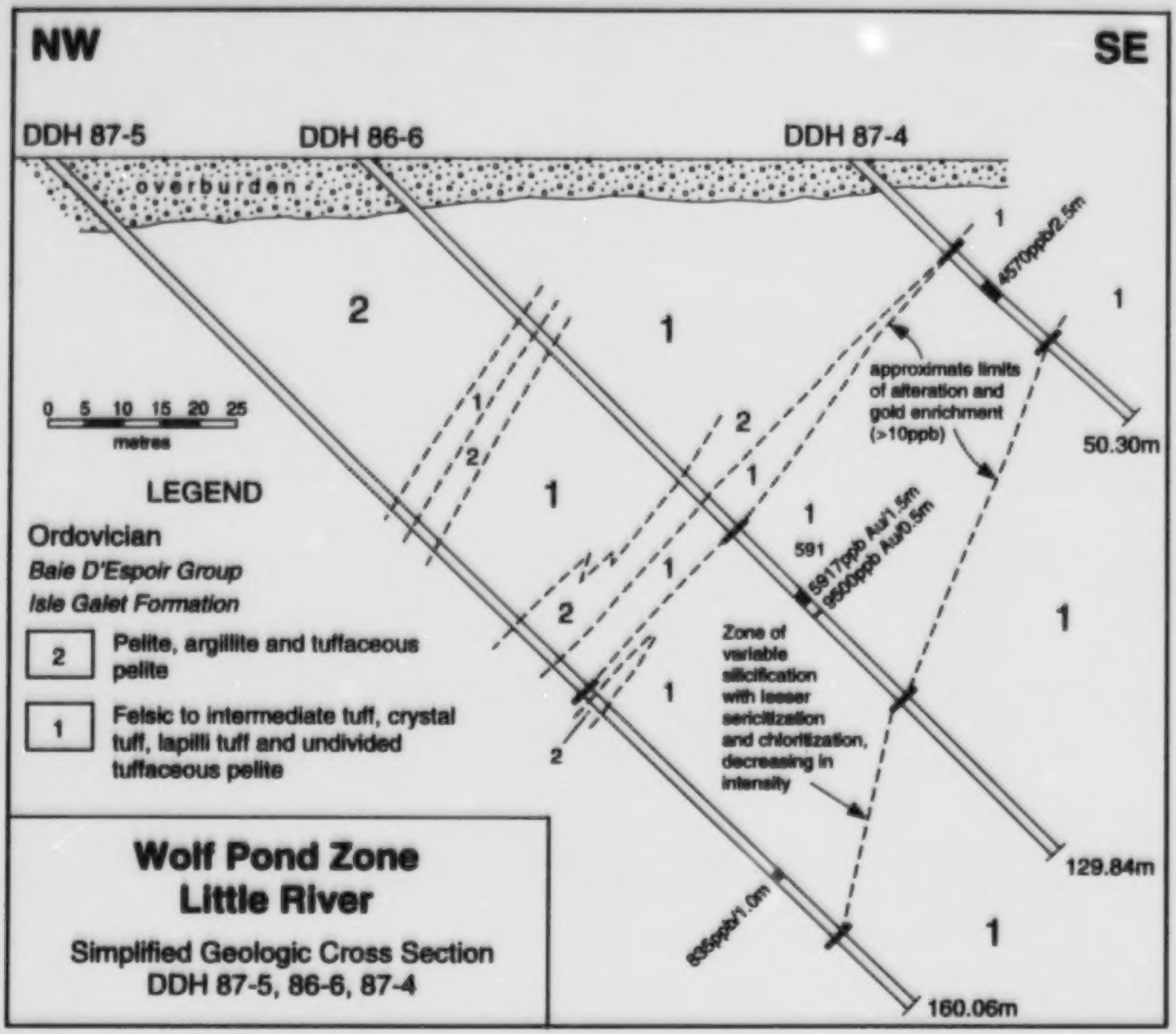


Figure 14. *Diamond-drill section (view to the northeast), Wolf Pond Zone, Little River (modified from McHale and McKillen, 1987).*

minerals senarmontite (Sb_2O_3), valentinite (Sb_2O_3) and a bright red unidentified antimony oxide (McHale and McKillen, 1987).

A quartz and sulphide-healed breccia zone was intersected by diamond drilling within the Wolf Pond Zone (McHale and McKillen, 1989a). This breccia zone contains 5 to 10 percent combined pyrrhotite, stibnite and arsenopyrite. No significant gold values were reported from the zone. However, a portion of the breccia assayed 3.3 percent Sb.

Petrographic analyses (McHale and McKillen, 1987) indicate that the gold is fine grained (4 to 5 microns) and occurs as free gold in quartz, within tiny quartz – carbonate fractures, and as coatings around both arsenopyrite and stibnite (McHale and McKillen, 1988). Diamond-drilling intersections include 6.51 g/t Au over 3.05 m and 1.37 g/t Au over 6.49 m (Table 5) (McHale and McKillen, 1988).

Assay results (McHale and McKillen, 1987, 1989a) from diamond drilling indicate a strong correlation between Au, As and Sb (Table 5). In the diamond-drill sections (except for 87-04 and 87-06) the correlation between Au and Sb is much weaker than the Au – As correlation; this suggests that the gold is mainly associated with the arsenopyrite. McHale and McKillen (1987) reported that stibnite mineralization was only observed within two of the Wolf Pond Zone trenches. This also supports a gold – arsenopyrite association as arseno-

Plate 13. *Cream to green to black, strongly cleaved intermediate volcanic rocks, Wolf Pond Zone, Little River. Small arsenopyrite needles occur adjacent to the quartz veining near the scale.*

Plate 14. *Close-up of quartz – stibnite vein developed within altered intermediate volcanic rocks, Wolf Pond Zone, Little River.*

pyrite is present in all mineralized sections. A sample of stibnite-bearing quartz vein, collected by the author from diamond-drill hole 87-06 at the 31.42 m interval, assayed 1.0 ppb Au, 0.2 ppm As and 7.95 percent Sb, also supporting a gold – arsenopyrite association.

Both disseminated and quartz vein-fracture styles of mineralization occur together in the same sections and hence it is difficult to resolve conclusively whether there is a gold – antimony association. Assay sample intervals from the diamond drilling average 0.5 m and sampling did not differentiate between the two styles of mineralization. The main point to emphasize is that significant gold mineralization is not always associated with antimony within the Wolf Pond Zone but is associated with arsenopyrite. McHale and McKillen (1989a) suggested that the two styles of mineralization within the Wolf Pond Zone represent two distinct stages; an early stratabound disseminated arsenopyrite – gold – stibnite (?) stage overprinted by a later antimony-rich stage. The Wolf Pond Zone is classified as an altered wall-rock style of gold mineralization.

31. 22 West Zone

Location and Access

The 22 West Zone (NTS 1M/13 Au009 UTM 605200 5305700) is located approximately 5 km south of the Harbour Breton Highway bridge over Little River (Figure 12). A logging road and skidder trail lead to the prospect.

Exploration History

In 1987, trenching by Westfield Minerals Limited to test the soil geochemical anomalies of gold, southwest of Wolf Pond (southwest of the Harbour Breton Highway), outlined a number of auriferous zones along what is referred to as the Tillicum horizon (McHale and McKillen, 1989a and b). The most significant of these zones is termed the 22 West Zone. The prospect has been trenched and tested with 16 diamond-drill holes (Figure 15).

Local Geology and Mineralization

Strongly weathered, northeast-trending, moderately northwest-dipping, intermediate crystal tuff or a monzonitic

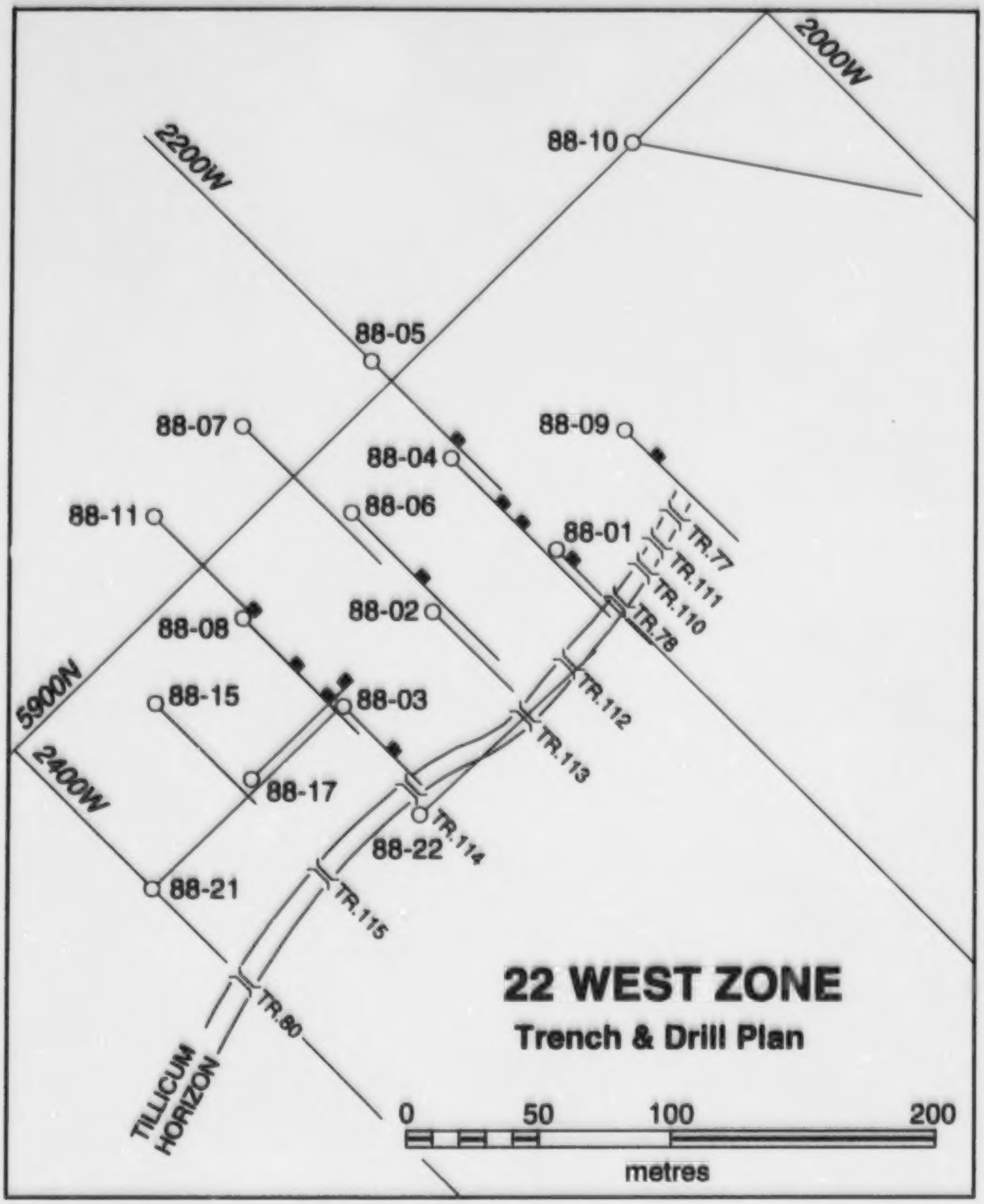


Figure 15. *Trench and diamond-drill hole plan, 22 West Zone, Little River (after McHale and McKillen, 1988).*

subvolcanic sill was exposed in a series of nine trenches at the 22 West Zone (McHale and McKillen, 1987).

Two styles of mineralization are present within the 22 West Zone and these are described by McHale and McKillen (1988) as: 1) disseminated arsenopyrite, pyrrhotite, pyrite, chalcopyrite, limonite and stibnite – berthierite in carbonitized and chloritized intermediate volcanic rocks; and 2) crosscutting and foliation parallel, arsenopyrite, stibnite – berthierite, pyrite and pyrrhotite-bearing, quartz – carbonate – sericite – chlorite veins. These veins are thought to be related to crosscutting structures that were identified from geophysical surveys (McHale and McKillen, 1988).

Gold-bearing sections are present in all nine trenches and range between 3 and 9 m in width over a strike length of approximately 250 m. Gold assays from the trenching include 0.15 oz/t over 1.0 m and 0.12 oz/t over 4.0 m (Table 6).

Table 6. Selected trench channel sample assay results, 22 West Zone, Little River (from McHale and McKillen, 1988)

Trench	Width (m)	Au (oz/t)
87-78	4.0	0.12
87-112	1.5	0.12
87-113	2.5	0.11
87-114	1.0	0.15

Sixteen diamond-drill holes were drilled along the 22 West Zone in 1988. The majority of diamond-drill holes intersected subeconomic grade gold mineralization. Significant gold values were only intersected in four diamond-drill holes (McHale and McKillen, 1989a and b; Table 7). Diamond-drill hole 88-21 (Figure 15), which is oriented approximately parallel to the regional trend of the Tillicum horizon, intersected a 1.5-m-thick zone that assayed 0.12 oz/t Au and >2.5 oz/t Ag (McHale and McKillen, 1989a and b). Such high concentrations of silver are not typical of the gold mineralization within the Little River area.

Gold concentrations within the 22 West Zone appear to vary significantly with the concentration of arsenopyrite (McHale and McKillen, 1988). Generally, sections with higher concentrations of arsenopyrite also have higher gold values. McHale and McKillen (1989b) stated that the total sulphide content of the 22 West Zone appears to decrease with depth, which may explain the lower gold grades in diamond-drill core. Antimony concentrations do not appear to correlate with gold and based on the diamond-drill hole data; McHale and McKillen (1989a and b) interpreted the 22 West Zone to be lensoidal.

Most of the antimony within the 22 West Zone occurs within the quartz – carbonate veins that are best developed within the central trenches (TR.112, TR.113 and TR.114; Figure 15) (McHale and McKillen, 1988). McHale and McKillen (1988) estimated that a 0.5 m section in trench TR.112 contained 5 percent berthierite – stibnite. Senarmonite and valentinite, both antimony oxides, were also identified within the zone (McHale and McKillen, 1988) and were interpreted to result from the weathering of berthierite – stibnite. The 22 West Zone is classified as an altered wall-rock style of gold mineralization.

36. True Grit

Location and Access

The True Grit showing (NTS 1M/14 Au014 UTM 601200 5315400) is located approximately 8 km northeast of the Head of Bay d'Espoir. Logging roads and skidder trails lead from the Bay d'Espoir Highway directly to the showing.

Table 7. Assay results from selected diamond-drill core from the 22 West Zone (from McHale and McKillen, 1989b). Results are in ppb and ppm except where otherwise stated

Hole #	Interval (m)	Au (ppb)	As (ppm)	Sb (ppm)	Ag (oz/t)
88-08	45.3-45.9	0.052 oz/t	1200	3800	-
	45.9-46.8	385	na	na	-
	46.8-47.3	0.066 oz/t	1500	1100	-
	47.3-47.8	0.076 oz/t	4000	1200	-
	47.8-48.2	0.029 oz/t	3800	80	-
	48.2-48.6	< 5	na	na	-
	48.6-49.1	0.006 oz/t	900	55	-
	49.1-49.7	10	na	na	-
	49.7-50.2	40	na	na	-
	50.2-51.0	0.050 oz/t	5000	70	-
	51.5-52.0	0.017 oz/t	1900	35	-
	51.5-52.0	0.120 oz/t	>10 000	180	-
	52.0-52.5	0.011 oz/t	900	20	-
	52.5-52.8	45	na	na	-
	60.1-60.6	0.005 oz/t	220	770	-
	60.6-61.1	0.031 oz/t	4250	60	-
	61.1-61.8	20	na	na	-
	62.5-63.0	0.130 oz/t	1700	5300	-
	63.0-63.5	0.072 oz/t	6500	5000	-
	63.5-64.0	0.160 oz/t	>10 000	2500	-
	64.0-64.5	0.085 oz/t	7400	230	na
	64.5-65.2	< 5	na	na	na
88-17	59.8-60.3	60	na	na	na
	60.3-60.8	0.140 oz/t	1.1%	1.7%	na
	60.8-61.3	0.190 oz/t	2.0%	1.7%	na
	61.3-61.8	0.100 oz/t	1.2%	1.3%	na
	61.8-62.3	0.200 oz/t	0.9%	3.9%	na
	62.3-62.8	0.083 oz/t	0.2%	1.5%	na
	62.8-63.3	0.068 oz/t	0.4%	0.7%	na
	63.3-63.8	30	na	na	na
88-21	34.2-34.7	660	na	na	na
	34.7-35.2	0.140 oz/t	na	52	na
	35.2-35.7	0.097 oz/t	na	65	na
	35.7-36.2	0.043 oz/t	na	18	na
	36.2-36.7	510	na	na	na
	54.4-54.9	150	60	1000	na
	54.9-55.4	0.170 oz/t	2000	>10 000	3.4
	55.4-55.9	0.065 oz/t	360	100	na
	55.9-56.4	0.140 oz/t	1400	5600	4.3
	56.4-56.9	0.038 oz/t	210	20	na

na–not analyzed

Exploration History

Teck Exploration Limited staked an extensive block of claims in the northern portion of the St. Alban's map area in

1989 as a follow up to lake-sediment arsenic and antimony anomalies reported by Davenport *et al.* (1989). Detailed prospecting, geological mapping, stream-sediment and glacial-till sampling in 1989 and 1990 located several significant geochemical (Au, As and Sb) soil anomalies (Pickett, 1990a). Trenching in the vicinity of several of these anomalies resulted in the discovery of auriferous, arsenopyrite-bearing quartz veins at the True Grit showing (Pickett, 1990a).

Local Geology and Mineralization

In 1990, trenching near the western margin of a 800-m-wide and 2.6-km-long soil anomaly exposed a 2-m-wide zone of quartz – chlorite veining (Plate 15, Figure 16). This zone has an exposed strike length of approximately 19 m, and is developed within siltstone of the St. Josephs Cove Formation (Pickett, 1990a, 1993). The zone trends about 30° and dips 75 to 80° east.

Plate 15. *Discovery trench, True Grit showing. Quartz – arsenopyrite mineralization is associated with the rusty zone located in the central portion of the picture.*

Host rocks to the mineralization comprise rusty, sericitic and chloritic siltstone that contain up to 5 percent disseminated arsenopyrite and minor pyrite. The arsenopyrite appears to be associated with the more chloritic portions of the wall rock (Plate 16). The degree of alteration and the abundance of sulphide minerals appear to decrease away from the veining. Pickett (1993) indicated that the alteration appears to be slightly more intense within the siltstone to the west of the quartz – chlorite zone.

The mineralization appears to occupy the core of a small antiformal fold. This folding may have produced small brittle fractures that controlled the site of the mineralization. Bedding to the southeast of the mineralization trends 330 to 360° and dips 10 to 20°E and to the west trends 10 to 30° and dips 35 to 65°E (Pickett, 1993).

Quartz veins within the mineralized zone contain irregular patches of chlorite, lesser sericite and variable amounts of arsenopyrite. The zone has an average grade of 7.3 g/t over a width of 0.69 m and a strike length of 8.3 m (Pickett, 1993). A grab sample assayed 30.2 g/t Au Pickett (1993) subdivided the zone into northern and southern sections. The northern portion, with a strike length of 3 m, consists of quartz – chlorite veins with minor sericite, 1 to 2 percent pyrite and 3 to 10 percent arsenopyrite. The arsenopyrite occurs as: 1) small laths up to 2 mm in length; 2) veinlets developed along quartz – chlorite contacts, and 3) locally as crystals in quartz vugs. A channel sample from this section assayed 15.6 g/t Au over 1 m (Pickett, 1990a).

The southern mineralized section, with a strike length of approximately 5 m, is less quartz rich and comprises chloritized and sericitized sandstone with up to 30 percent disseminated arsenopyrite. The arsenopyrite occurs as well formed euhedral 1 to 15 mm crystals (Pickett, 1993). The southern end of the zone consists of angular wall-rock fragments in an arsenopyrite-bearing chlorite-rich matrix (Pickett, 1993). Assay results from the southern section include 9.8 g/t Au over 1 m, 18 g/t over 0.5 m and 6.5 g/t over 0.5 m. A grab sample of the arsenopyrite-bearing quartz vein, collected by the author from the southern section, assayed 9.6 g/t Au. The True Grit showing is classified as an arsenopyrite-rich quartz-vein style of mineralization.

44. Kim Lake

Location and Access

The Kim Lake #2 prospect (NTS 2D/03 Sb001, UTM 624710 5326130) is located in a remote area approximately 18 km east of the Bay d'Espoir Highway (Route 360). All-terrain vehicles can be used to reach the prospect.

Exploration History

The Kim Lake area was included in one of the extensive mineral concession areas granted to the Newfoundland and Labrador Corporation (NALCO). In the mid-1950s NALCO undertook an extensive exploration program in the St. Alban's area. NALCO prospector George Willcot discovered the Kim Lake #2 prospect in 1956 (Wall, 1956a). At the time of discovery the stibnite was misidentified as galena. A vertical loop EM survey was undertaken and a weak conductor was outlined at the prospect (McPhar Geophysics Limited, 1956). Diamond drilling was recommended but was never undertaken.

The area was optioned by Noranda Exploration Company Limited in the late 1960s. Noranda did not examine the Kim Lake #2 prospect but the area was included in an airborne EM and magnetic survey (McPhar Geophysics Limited, 1969). Hudson's Bay Oil and Gas Limited (HBOG) optioned the Kim Lake area from NALCO and conducted detailed geological,

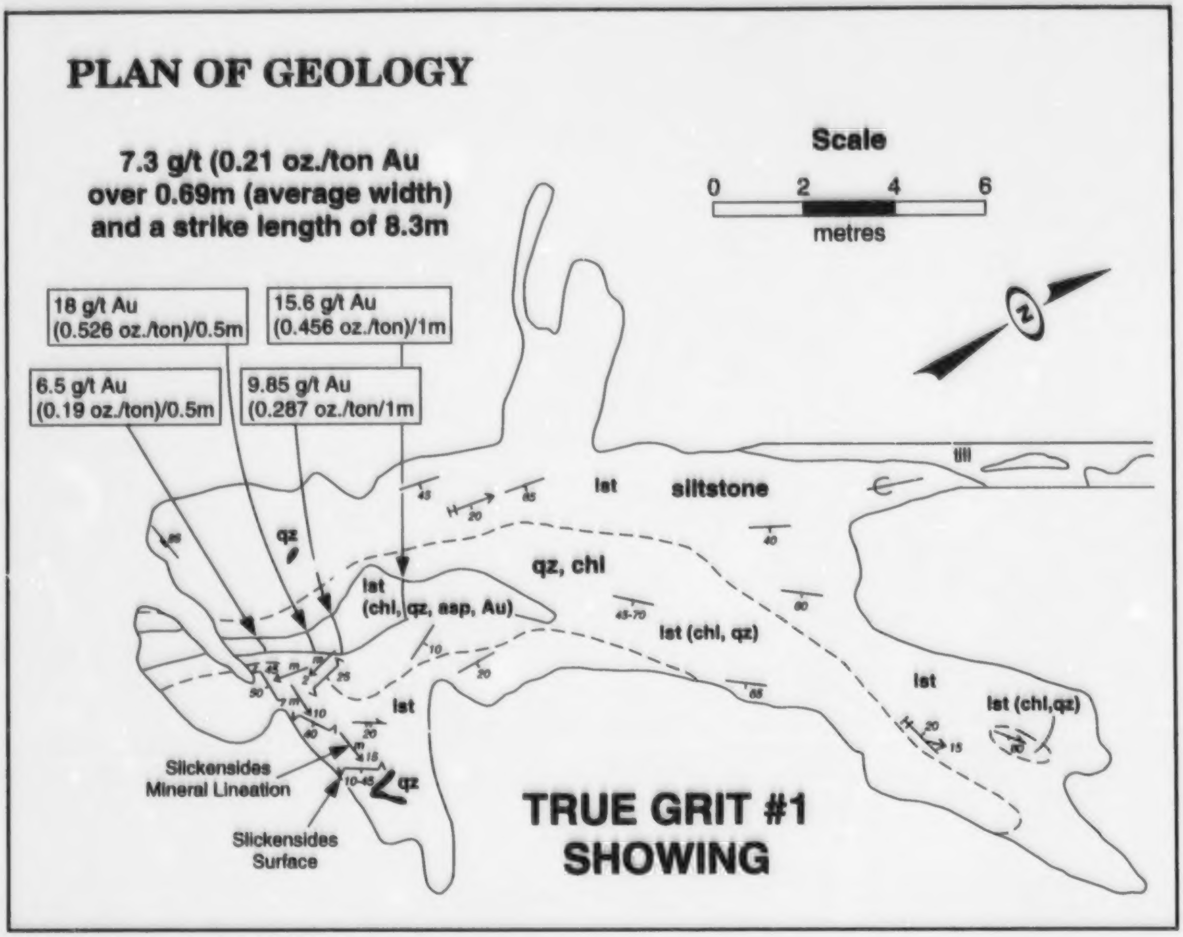


Figure 16. *Geology of the True Grit showing (from Pickett, 1993).*

Plate 16. *Vuggy quartz veining developed within pelite of the St. Josephs Cove Formation, True Grit showing. Coarse patches of fine-grained chlorite and arsenopyrite are localized within the vugs.*

geochemical and geophysical surveys of the area between 1977 and 1981 (Dean, 1978b; Fenton, 1981a). A reconnaissance airborne EM and magnetic survey of the area was undertaken for HBOG in 1979 (Aerodot, 1979).

In 1980, HBOG conducted ground geophysical (VLF-EM, total-field magnetics and limited HLEM) and soil-geochemical surveys, geological mapping and trenching of the Kim Lake #2 prospect (Fenton, 1981a). Both the geophysical and soil-geochemical surveys failed to delineate any significant anomalies related to the mineralization. The VLF-EM survey outlined two approximately stratigraphic parallel anomalies that extended beyond the area examined. Diamond drilling was recommended but never undertaken as HBOG relinquished its concession option in 1982; the NALCO concession reverted to the Crown in 1984.

In May 1984, Tillicum Resources Limited staked an area surrounding the Kim Lake #2 prospect for Westfield Minerals Limited. In the fall of 1984, Westfield conducted reconnaissance geological mapping, soil and basal till geochemical and geophysical surveys and trenching (McHale, 1985a). A number of Au, As, Sb soil-geochemical anomalies associated with felsic volcanic rocks were outlined over a 7 km strike length. In 1985, Westfield Minerals drilled 6 diamond-drill holes, totalling 307 m (Murphy, 1985) to test the gold (soil and basal till) anomalies and trench results outlined in 1984.

Local Geology and Mineralization

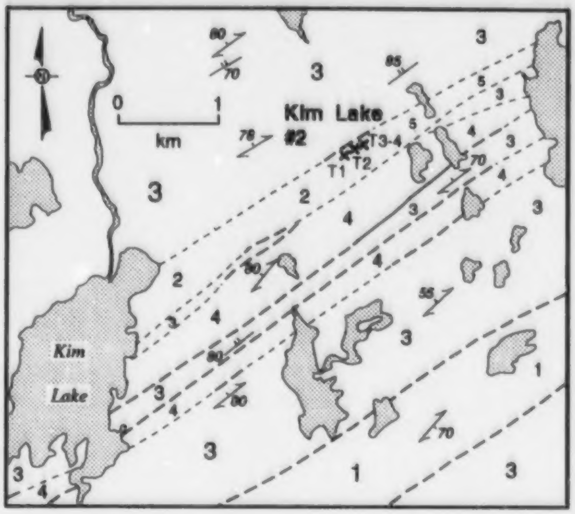
The area is underlain by massive rhyolite and minor tuffaceous rocks of the Isle Galet Formation and the Kim Lake Granite (Dickson, 1987a; Figure 17). Weathered, fine-grained, locally feldspar-phyric, variably sericitized rhyolite is exposed in the trenches (Plate 17, Figure 18). The rock weathers rusty to creamy-beige but is light grey on fresh surfaces. Small irregular, bleached-looking (?), greenish-brown patches, which may be poorly preserved lithic fragments, are common. Limonitic patches and bands up to 1 mm wide are common to the more weathered portions of the trenches. Thin irregular hematite veinlets and patches up to 5 mm across occur throughout the trenches (McHale, 1985a). Fine-grained disseminated sulphides occur throughout the rhyolite. Exposed immediately northeast of the trenches is the Kim Lake Granite (Dickson, 1987a; Figure 17). This altered, brecciated and quartz-veined granite exhibits stibnite-coated joints.

The rhyolite exhibits a weakly developed cleavage which trends 40° and dips 88°NW. In trenches 3 and 4, the eastern most trenches, the rhyolite is heavily fractured.

The HBOG collected grab samples from the Kim Lake antimony prospect in 1978 that assayed 1.94 percent Sb and 0.277 oz/t Au and 1.25 percent Sb and 0.285 oz/t Au respectively (Dean, 1978b). Three trenches were excavated, mapped and sampled in detail (Fenton, 1981a; Figure 19). The sampling results failed to duplicate the results of Dean (1978b).

Westfield Minerals Limited excavated seven trenches, five of which coincided with the HBOG trenching. Anomalous but low-gold values were reported from these five trenches (McHale, 1985a). Significant gold values up to 5660 ppb were reported from narrow 10- to 13-cm-wide quartz – stibnite veins exposed in trenches 1, 2 and 4 (Figure 18).

Mineralization exposed in the trenches occurs both as weakly disseminated pyrite, arsenopyrite and stibnite in the rhyolite and as erratic, crosscutting, sulphide-bearing extensional quartz veins (Plate 18). Pyrite and arsenopyrite also occur as fine, discontinuous, < 1 mm thick veinlets and as aggregates up to 1.5 mm in diameter (McHale, 1985a).



LEGEND

ORDOVICIAN

5 Kim Lake Granite

MIDDLE ORDOVICIAN AND YOUNGER

Baie d'Espoir Group

4 *Kaegudeck diabase*

Isle Galet Formation

3 *Red and grey sandstone, locally micaceous, buff to cream slate, pelite and pebble conglomerate*

2 *Massive rhyolite and lesser tuffaceous rocks*

1 *Green to grey chlorite schist with interbedded, deformed pillow lava*

SYMBOLS

Geological contact (defined, approximate, assumed)

Bedding (tops unknown)

Cleavage

× T2 *Trench*

Figure 17. *General geology of the area surrounding the Kim Lake #2 prospect (modified from Dickson, 1987a).*

Three dominant vein orientations were reported by McHale (1985a); 1) 15° to 68°/70° to 90°SE; 2) 0° to 40°/35° to 85°NW; and 3) 100° to 170°/55° to 90°SW. The

Plate 17. *Trenches 3 and 4, Kim Lake #2 prospect. In the foreground is rusty-weathering, quartz-veined rhyolite.*

Plate 18. *Extensional quartz vein with angular wall-rock fragments developed within altered rhyolite, Kim Lake #2 prospect.*

quartz veins are weakly laminated and locally exhibit cocks-comb textures and small angular wall-rock fragments. The stibnite also occurs as fine disseminations and blebs both in the veins and in the wall rock. Stibnite-rich grab samples assayed up to 10.22 and 46.90 percent Sb (McHale, 1985a). Vein samples with coarse stibnite were only observed in the rubble surrounding trenches 3 and 4. These veins are also weakly laminated and contain stibnite both as coarse patches and bands up to 7 cm wide that have been developed along the vein margins.

The diamond drilling conducted by Westfield Minerals Limited outlined a zone of stockwork-like quartz veining anomalous in gold (up to 0.1 oz/t Au over narrow widths). The zone was traced for approximately 175 m but remains open both down dip and along strike (Murphy, 1985).

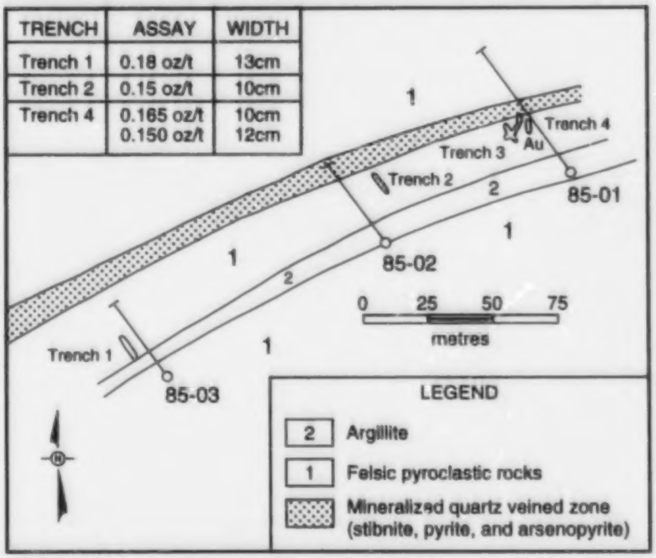


Figure 18. *Local geology of the Kim Lake #2 prospect; also shown are the locations of trenches 1 to 4 and diamond-drill holes 85-01, 85-02 and 85-03 (from Murphy, 1985). Assay results of quartz vein grab samples are included.*

Gold concentrations within the Kim Lake #2 prospect are erratic. The best values appear to be associated with the extensional quartz veining. McHale (1985a) suggested an Au – As association based on assay results. This interpretation is partially supported by the trench assay data from Fenton (1981a; Figures 19). The prospect is classified as an arsenopyrite (±stibnite)-rich quartz-vein style of gold mineralization.

GREAT BEND – PAULS POND AREA

Location and Access

The majority of gold occurrences within the Great Bend–Pauls Pond area occur within the Eastern Pond (NTS 2D/11) map area. Logging roads originating at Glenwood and the Bay d'Espoir Highway (Route 360) disect much of the area. The area is characterized by a gently undulating topography covered by an extensively glacial till. Bedrock exposure is scarce except along the incised stream and river valleys. Much of the region has been affected by clear cutting and large forest fires.

Regional Setting, Deformation and Metamorphism

The Great Bend–Pauls Pond area is dominated by rocks of the Exploits Subzone. The regional geology (Figures 20 and 21) of the area can be described in terms of four main rock groupings (cf. Dickson, 1992): 1) Ordovician and older sedimentary rocks of the Mount Cormack Subzone (Gander Zone); 2) Cambro-Ordovician ophiolitic rocks of the Pipestone Pond, Coy Pond and Great Bend complexes; 3) Ordovician and Silurian sedimentary rocks of the Davidsville Group and North

Vein	Cu ppm	Pb ppm	Zn ppm	Au ppb	Sb ppm	As ppm
E-1	34	4	39	1200	120000	<4000
E-2	23	3	72	92	64000	<4000
E-3	38	3	41	35	45000	<4000
E-4	69	20	35	330	240	2100

Channel	Au ppb	Sb ppm	As ppm
0.00-3.00	6	170	22
3.00-6.00	52	180	160
6.00-9.00	49	3300	130
9.00-12.0	20	2600	500
12.0-15.0	39	130	280
15.0-16.0	7	150	23

Variably hematized and silicified rhyolite with 1 to 3 percent disseminated pyrite and minor quartz veining.

E-1 vein 2.25 cm long, 3-7 cm wide
E-2 vein 20 cm long, 1-3 cm wide
E-3 vein 1750 cm long, 1-3 cm wide
E-4 vein (?)

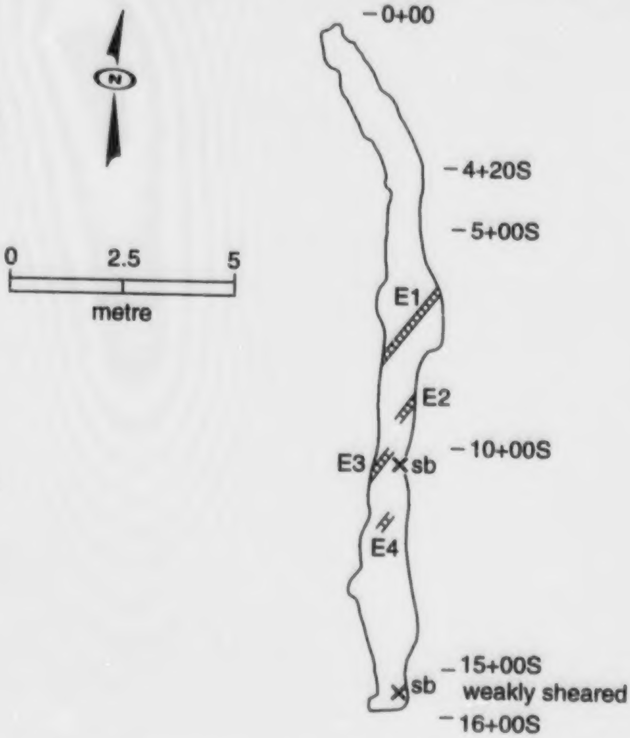


Figure 19a. *Trench maps, Kim Lake #2 prospect. Trench 1 map with channel and grab sample results (modified from Fenton, 1981a).*

Vein	Cu ppm	Pb ppm	Zn ppm	Au ppb	Sb ppm	As ppm
M-1	21	19	28	710	330	7000
M-2	19	11	31	510	180	5400
M-3	25	27	30	810	140	9800
M-4	18	10	46	11	210	14
M-5	19	14	41	6	300	37
M-6	19	32	37	64	230	10000
M-7	17	14	18	2500	250	63000

Channel	Au ppb	Sb ppm	As ppm
0.00-3.00	11	91	61
3.00-6.00	40	38	260
6.00-8.00	19	220	180

Variably hematized and silicified rhyolite with minor disseminated pyrite and abundant quartz veining.

M-1 vein 30-40 cm long, 2-4 cm wide
M-2 vein 15 cm long, 2-4 cm wide
M-3 vein 15 cm long, 2-4 cm wide
M-4 vein (?)
M-5 vein length (?), 5-7 cm wide
M-6 vein length (?), 3-5 cm wide
M-7 vein 25 cm exposed, 5-7 cm wide

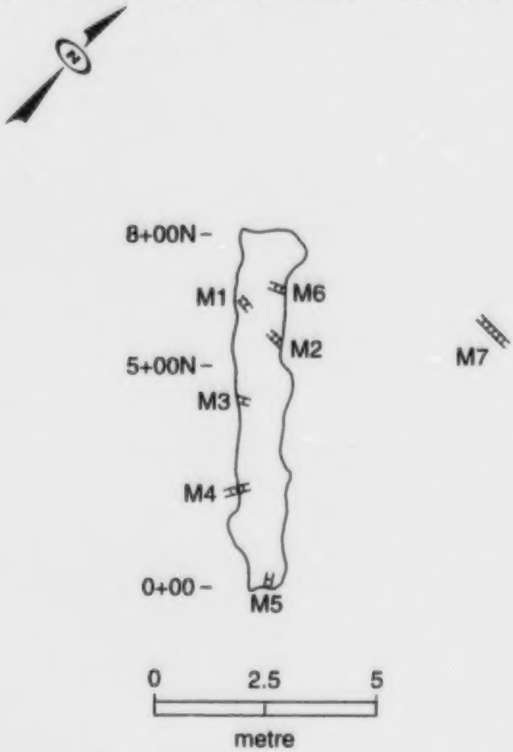
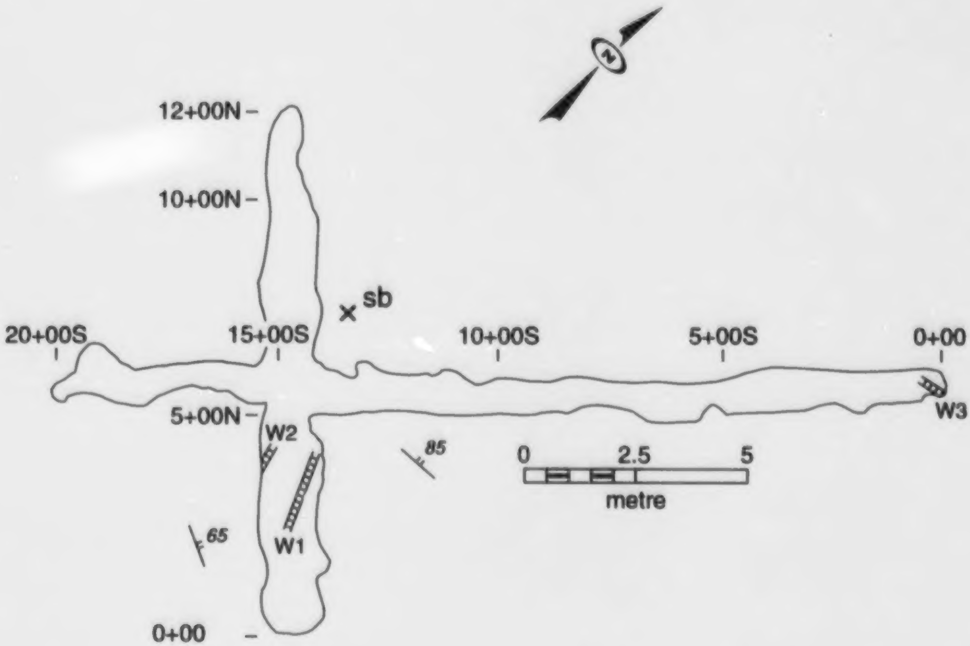


Figure 19b. *Trench 2 map with channel and grab sample results (modified from Fenton, 1981a).*

Steady Pond Formation–Botwood Group respectively; and 4) plutonic rocks of the Mount Peyton Intrusive Suite.

The sedimentary rocks of the Mount Cormack Subzone are interpreted to occur as a thrust-bound window, exposed through the overlying allochthonous Exploits Subzone (Colman-Sadd and Swinden, 1984). The traces of these thrusts are marked by the dismembered ophiolitic complexes.

The ophiolitic rocks are interpreted to have been emplaced in the late Arenig during the Penobscot Orogeny (Colman-Sadd *et al.*, 1992). The younger Ordovician and Silurian sedimentary rocks are interpreted to have been deposited unconformably upon a composite crust of Gander Zone continental basement and allochthonous ophiolitic rocks (Colman-Sadd *et al.*, 1992).



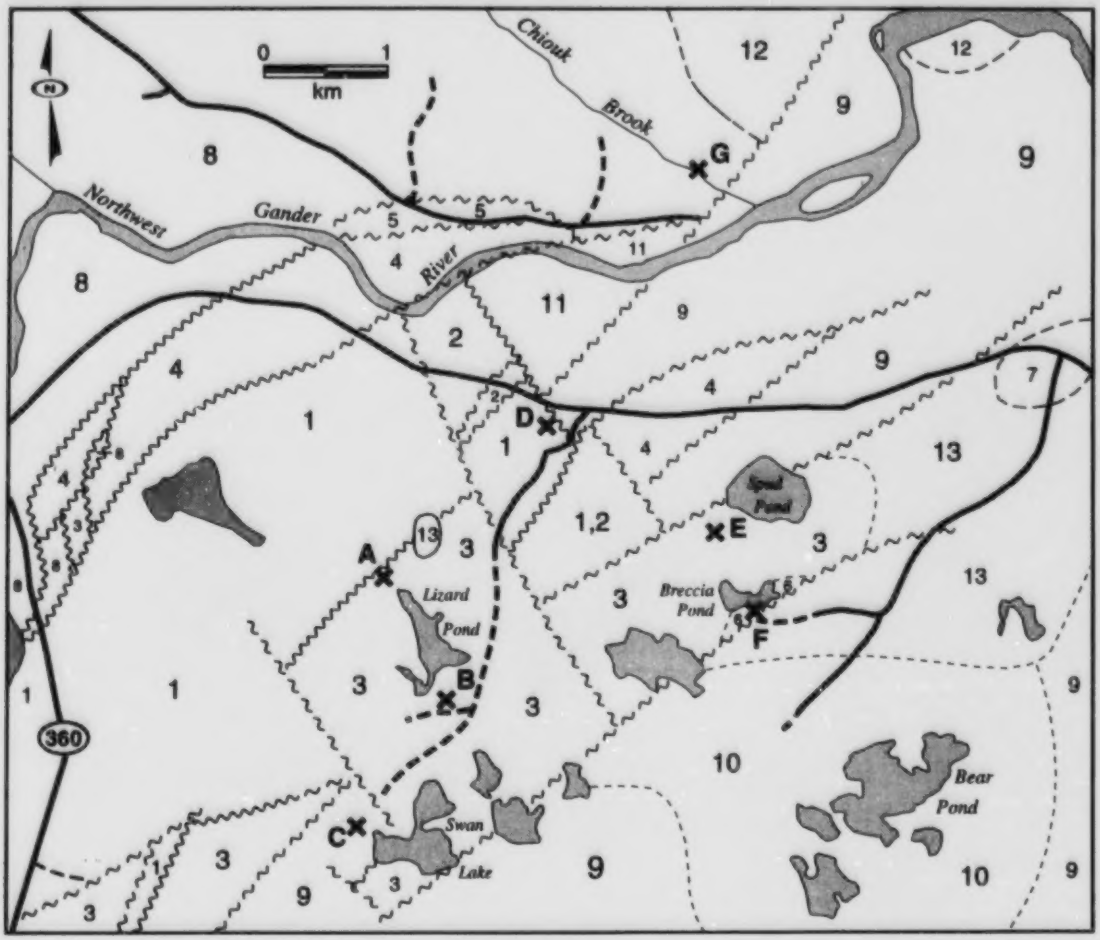
Vein	Cu ppm	Pb ppm	Zn ppm	Au ppb	Sb ppm	As ppm
W-1	57	5	30	20	83000	<4000
W-1	24	9	22	110	430	300
W-2	38	3	22	17	42000	<4000
W-3	330	35	57	490	550	2800

Channel	Au ppb	Sb ppm	As ppm
0.0-3.0	17	66	83
3.0-6.0	35	94	73
6.0-9.0	10	58	41
9.0-12.0	17	75	54
12.0-15.0	8	79	57
15.0-18.0	18	89	100

Channel	Au ppb	Sb ppm	As ppm
0.0-3.0	14	100	130
3.0-6.0	19	98	98
6.0-9.0	28	490	95
9.0-12.0	14	390	45

Cream, grey, pale green, variably sericitized and quartz veined, feldspar-phyric rhyolite with 1 to 3 percent pyrite as disseminations, veinlets and small aggregates. W-1, W-2, W-3 are described as significant quartz veins.

Figure 19c. *Trench 3 map with channel and grab sample results (modified from Fenton, 1981a).*



LEGEND

DEVONIAN OR YOUNGER

| 13 | *Feldspathic sandstone, pebble and cobble conglomerate* |

SILURIAN TO DEVONIAN

12	Mount Peyton Intrusive Suite
11	Great Bend gabbro
10	Bear Pond gabbro

SILURIAN (?)

| 9 | Undivided North Steady Pond Formation and Botwood Group |

ORDOVICIAN (CARADOC)

| 8 | *Black ribbon chert and slate* |

CAMBRIAN TO EARLY ORDOVICIAN

7	Spruce Brook Formation
6	*Hematitic and silicified ultramafic breccia*
5	*Chloritized mafic volcanic rocks*
4	*Amphibolite*
3	*Schistose magnesite*
2	*Dunite and harzburgite*
1	*Peridotite*

SYMBOLS

Fault (defined, assumed) ....

Geological boundary (defined, approximate, assumed) ....

Road ....

Figure 20. *General geology and gold occurrences of the area underlain by the Great Bend Complex (from Dickson, 1991). A) Lizard Pond North, B) Lizard Pond South, C) Swan Lake, D) Northwest Gander Road, E) Spud Pond, F) Breccia Pond, and G) Chiok Brook.*

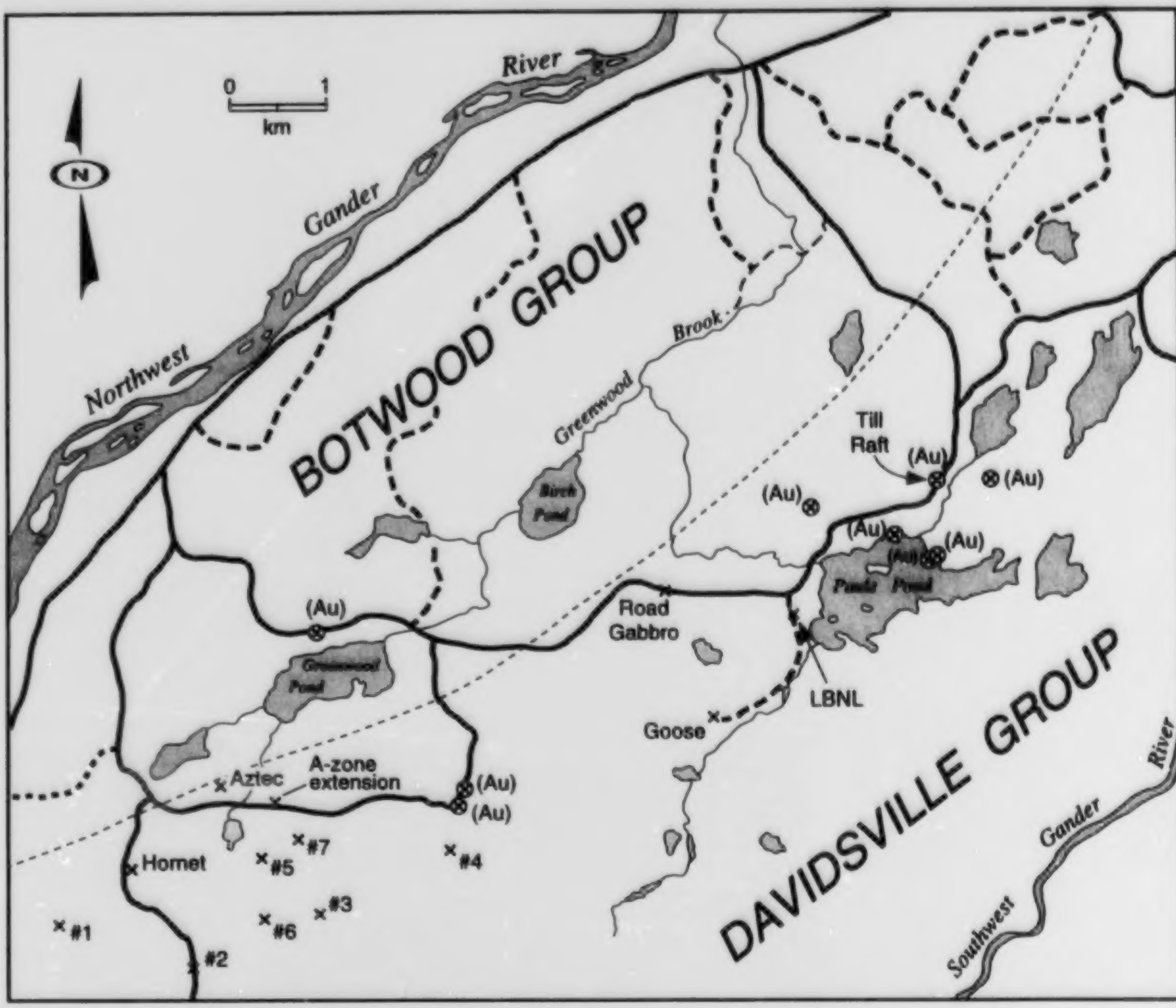


Figure 21. *General geology, gold occurrences and significant mineralized float of the Pauls Pond area (geology from Blackwood, 1981). Numbered gold occurrences are listed in Appendix 2 as Greenwood Pond #1, Greenwood Pond #2, etc.*

The Mount Peyton Intrusive Suite is a composite Silurian postkinematic intrusion that consists of gabbro, tonalite, granodiorite and granite (Dickson, 1992). Regionally, the rocks have been subjected to lower greenschist-facies metamorphism and locally within in contact aureole of the Mount Peyton Intrusive Suite to amphibolite grade.

Previous Work

The Great Bend area was first mapped and described in detail by the Geological Survey of Newfoundland (Grady, 1952, 1953). The ultramafic and gabbroic rocks were interpreted to be intrusive and the sedimentary rocks were correlated with Ordovician rocks exposed in the Hamilton Sound area of Notre Dame Bay. This work also emphasized the potential for deposits of high-quality magnesite associated with the ultramafic rocks. Many of the ponds in the Great Bend area were informally named during this study (e.g., Lizard Pond, Spud Pond, Swan Lake and Breccia Pond) and these names are still used on geological maps of the area.

The Newfoundland and Labrador Corporation Limited (NALCO) began to examine the magnesite potential of the Great Bend area in the early 1950s (Harrison, 1953; Coleman, 1954). A bulk sample was obtained (Newfoundland and Labrador Corporation Limited, 1953) but analyses revealed the presence of abundant fine-grained silica, which would make recovery of the magnesite difficult (Newfoundland and Labrador Corporation Limited, 1954; Stewart, 1957). Three of the magnesite showings located near Lizard Pond were drilled in 1963 (Bell Asbestos Mines Limited, 1963).

The Great Bend–Pauls Pond area was included in regional 1:250 000-scale geological mapping of the Gander Lake (NTS 2D) map area by the Geological Survey of Canada (Anderson and Williams, 1970). Later, the Great Bend Complex was examined by Kean (1974) and he concluded that the ultramafic and gabbroic rocks formed as mantle diapirs. This interpretation was in part supported by a subsequent study by Malpas and Strong (1975). In that study, Cr:Al ratios of chrome spinels collected from eastern Newfoundland, were compared to chrome spinels collected from the western Newfoundland ophiolites. The variation in Cr:Al ratios was interpreted to support the mantle diapir origin for ultramafic and associated rocks from the eastern Dunnage Zone. The Great Bend Complex was interpreted by Colman-Sadd and Swinden (1982, 1984) to be ophiolitic and part of the allochthonous Coy Pond Complex.

The Newfoundland Department of Mines and Energy conducted regional 1:50 000-scale geological mapping of the Great Bend–Pauls Pond area, which was undertaken by Blackwood (1981), NTS 2D/11 (east half), Colman-Sadd (1982), reconnaissance mapping in the Great Bend area, and, Dickson (1991; 1992), NTS 2D/11 (west half).

The Great Bend Complex and adjacent rocks were mapped at a scale of 1:50 000 by the Geological Survey of Canada (Zwicker and Strong, 1986). Auriferous slate was discovered in Chiouk Brook during the course of the mapping project (Zwicker and Strong, 1986).

The U.S. Borax and Chemical Corporation, Jascan Resources Incorporated, Atlantic Goldfields Incorporated, BPCan and Noranda Exploration Company Limited have all conducted extensive exploration for gold in the Great Bend–Pauls Pond area.

Gold Occurrences

47. Chiouk Brook

Location and Access

The Chiouk Brook prospect (Figure 20; NTS 2D/11 Au001 UTM 616200 5383950) is exposed in the bed of Chiouk Brook approximately 5 km east of the Bay d'Espoir Highway (Route 360) and 0.6 km north of the Northwest Gander River. An abandoned logging road and muskeg trail lead to the prospect.

Exploration History

Auriferous arsenopyrite mineralization was first noted at Chiouk Brook during regional geological mapping by Zwicker and Strong (1986). The Chiouk Brook area was staked by L. Murphy and optioned to U.S. Borax and Chemical Corporation in 1986. The company conducted geological mapping, trenching, geophysical surveys (IP, VLF-EM and Magnetic) and diamond drilling (5 holes totalling 401.4 m) in the vicinity of the Zwicker–Strong discovery (Burton, 1987).

In 1987, the U.S. Borax properties were obtained by 646509 Ontario Limited and Jascan Resources Incorporated (Mercer, 1988a). 646509 Ontario Limited was later amalgamated with Choiceland Iron Mines to form Atlantic Goldfields Incorporated. A.C.A. Howe International Limited was contracted to undertake geological exploration of the Chiouk Brook–Lizard Pond area. Diamond drilling consisting of 7 holes, totalling 840.88 m, was undertaken around the Chiouk Brook prospect (Mercer, 1988b). Subeconomic concentrations of gold were encountered in several of the diamond-drill holes.

Following the 1987 field season, Atlantic Goldfields Incorporated and Jascan Resources Incorporated decided not to renew their option agreement due to disappointing exploration results.

Local Geology and Mineralization

Extensive overburden in the Chiouk Brook area hinders geological mapping. Limited exposure combined with diamond-drill core indicates that the Chiouk Brook area (Figure 22) is underlain by a mélange comprised of sedimentary, ultramafic and gabbroic rocks (Burton, 1987). Extensive graphitic sediments in fault contact with ultramafic blocks were intersected in the diamond-drill core. Also, poor drill core recovery due to broken rock and over-pressured faults (Burton, 1987) indicates the structural complexity of the area. Three linear trends (north to north-northeast – the most prominent trend – northeast and east – west) interpreted to represent faults or shear zones were identified from the geophysical surveys.

The original discovery, as described by Zwicker and Strong (1986), is located approximately 600 m north of the Northwest Gander River. It consists of disseminated arsenopyrite needles, pyrite and chalcopyrite (?) within grey – black brecciated slate. The mineralized zone trends 098°, dips 30° northeast and is exposed for approximately 100 m along Chiouk Brook; assay results of grab samples collected by Zwicker and Strong (1986) are presented in Table 8.

Burton (1987) described the discovery outcrop as a massive, fine-grained, siliceous sediment that contained up to 5 percent disseminated arsenopyrite. Grab samples from the exposure assayed up to 1789 ppb Au and about 10 m downstream from the outcrop boulders similar to the discovery outcrop were found (Plates 19 and 20). These boulders contained up to 20 percent disseminated arsenopyrite, and when sampled and assayed contained up to 0.6 oz/t Au and 4.06 percent As (Burton, 1987). An unsuccessful attempt at

Table 8. Grab sample analyses from Chiouk Brook showing (from Zwicker and Strong, 1986)

Sample	Rock Type	Au (ppb)	As (ppm)	Ag (ppm)	Sb (ppm)	Te (ppm)	W (ppm)	Hg (ppm)
GB.85.345	Slate	1900	24 000	<0.5	47.0	<0.1	<3	54
GB.85.346	Slate	3	48	<0.5	4.5	<0.1	7	<5
GB.85.347	Slate	1	21	<0.5	4.5	<0.1	1	12

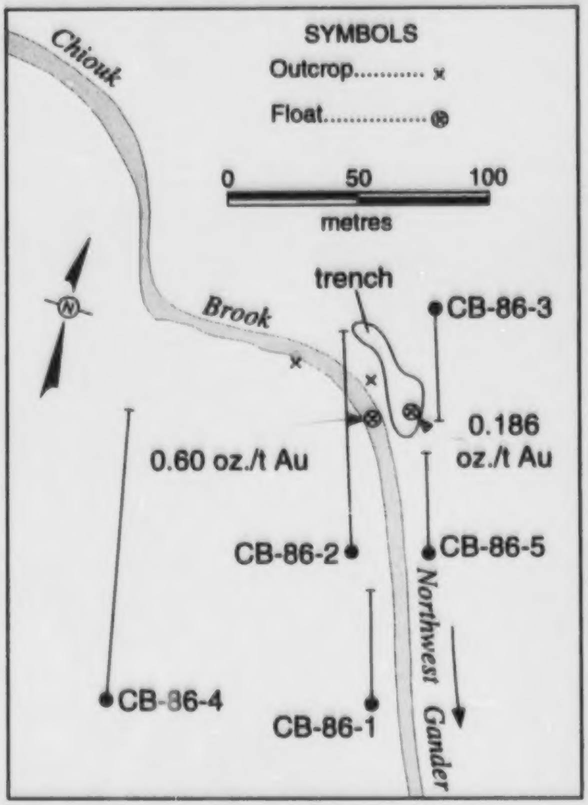


Figure 22. *Local geology and diamond-drill hole location map of the Chiouk Brook prospect (from Mercer, 1988a).*

Plate 19. *Siliceous, arsenopyrite-bearing boulders, Chiouk Brook prospect.*

trenching near the discovery outcrop exposed five more mineralized boulders.

The mineralized zone as observed in diamond-drill core (CB-86-2) is about 22 m thick. It consists of variable amounts of disseminated arsenopyrite and lesser pyrite, pyrrhotite and chalcopyrite within silicified tectonic breccia and serpentinite (Burton, 1987). Within the tectonic breccia, the arsenopyrite occurs as disseminations associated with brecciated siliceous stringers. Minor arsenopyrite also occurs within narrow graphitic zones. In the serpentinite, the arsenopyrite occurs as fine disseminations, tiny stringers and locally as coarse-grained euhedral crystals up to 3 mm long (Burton, 1987). Assay results are presented in Table 9. The Chiouk Brook prospect is classified as a disseminated style of gold mineralization.

48. Lizard Pond South

Location and Access

The Lizard Pond South prospect (Figure 20; NTS 2D/11 Au002 UTM 614200 5379550) is located approximately 3 km east of the Bay d'Espoir Highway (Route 360) and 3 km south of the Northwest Gander River. An abandoned logging road and muskeg trail lead to the prospect.

Exploration History

In 1987, Atlantic Goldfields Incorporated and Jascan Resources Incorporated staked 3 claim blocks in the Lizard

Plate 20. *Closeup of silicified sedimentary boulder (shown in Plate 19) containing up to 20 percent fine-grained disseminated arsenopyrite, Chiouk Brook.*

Pond area. A.C.A. Howe International Limited was contracted to conduct geological, geophysical and geochemical surveys and diamond drilling (Mercer, 1988a and b). This work resulted in the discovery of a zone of mineralized subcrop referred to as the Mercer showing.

After discouraging exploration results, Atlantic Goldfields Incorporated and Jascan Resources Incorporated terminated their exploration activities in the Lizard Pond area. The ground was subsequently staked by L. Murphy and optioned to BPCan who conducted an extensive exploration program that included geological mapping, trenching, geophysics, diamond drilling and sampling (Graham, 1989, 1990).

Local Geology and Mineralization

The Mercer showing comprised a zone of intensely silicified siltstone float that contained up to 15 percent disseminated arsenopyrite and pyrite (Mercer, 1988a). The silicified rock contained abundant open-space cavities lined with 1- to 2-mm euhedral quartz crystals. Grab samples of the float assayed up to 8 to 10 ppm Au.

Seven diamond-drill holes were drilled in the vicinity in the Mercer showing (Figure 23). Only Hole LB-87-01 cut alteration and mineralization similar to that observed in the mineralized float (Mercer, 1988b). The diamond-drill hole intersected a dark-grey siltstone cut by narrow, locally vuggy, quartz breccia veins up to 5 cm thick containing patchy silicification. Arsenopyrite is generally extremely fine grained and occurs both in the quartz veins and as disseminations in the wall rock. However, it is less abundant than observed in the float (Mercer, 1988b). Assay results indicate anomalous gold values over a width of approximately 50 m, but the more significant results are restricted to a zone 15 m wide (Table 10).

In 1989, BPCan trenched the area of subcrop at the Mercer showing and exposed a zone of quartz veining now referred to as the Lizard Pond South prospect (Plate 21, Figure 24). The prospect comprises a series of sporadic, fault-controlled, quartz breccia veins, which trend 75 – 85° and dip 70°S, (Plate 21) developed within grey –

Table 9. Selected assay results from diamond-drill hole CB-86-2, Chiouk Brook (data from Burton, 1986)

Interval (m)	CB-86-2 Au (ppb)	As (ppm)
13.06-14.16	<5	110
14.16-14.31	3600	4000
15.24-15.54	1120	1700
15.54-15.79	4000	5600
15.79-16.04	3850	4100
16.29-16.54	14550	1900
16.54-16.79	40	210
16.79-17.04	350	1400
17.04-17.29	3020	4000
17.29-17.54	500	1900
19.42-20.42	125	320
20.42-21.42	45	100
21.42-22.22	40	210
22.22-23.22	210	600
23.22-24.22	220	340
24.22-25.22	2450	5400
25.22-26.22	200	770
26.22-27.22	400	2600
27.22-28.22	1520	6100
28.22-29.22	965	2900
29.22-30.22	75	290
30.22-30.90	100	210
30.90-31.90	325	430
31.90-32.90	145	2200
32.90-33.90	175	1800
33.90-34.90	155	2100
34.90-35.90	310	1400
35.90-36.90	85	250
36.90-37.90	<5	60

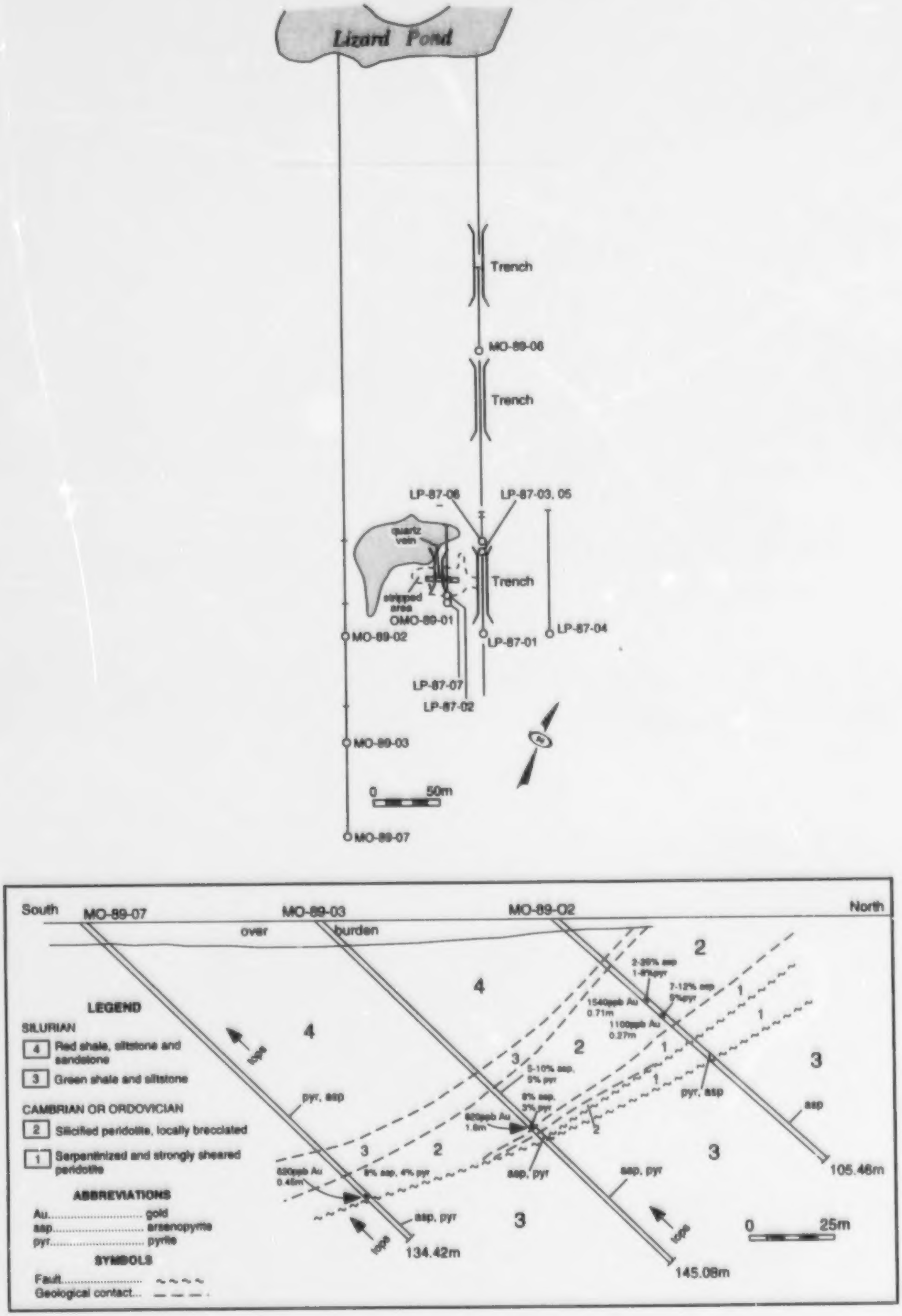


Figure 23. *Diamond-drill and trench location map and diamond-drill section, Lizard Pond South prospect (from Graham, 1990).*

Table 10. Selected diamond-drill hole assay results, Lizard Pond South area (data from Mercer, 1988b)

Interval (m)	LP-87-01	Au (ppb)
66.6-67.6		1675
67.6-68.6		290
68.6-69.6		99
69.6-70.6		260
70.6-71.6		545
71.6-72.6		154
72.6-73.6		2599
73.6-74.6		557
74.6-75.6		428
75.6-76.6		1017
76.6-77.6		885
77.6-78.6		89
78.6-79.6		414
79.6-80.6		2259
80.6-81.6		383
81.6-82.6		113
89.6-90.6		468
90.6-91.6		208
91.6-92.6		<5
104.24-105.24		45
105.24-106.24		640
106.24-107.24		132
107.24-108.24		233
113.23-114.23		115
114.43-115.43		351
115.43-116.43		517
122.44-123.44		13
123.44-124.44		<5

Plate 21. *Structurally controlled quartz-breccia veins developed within silificied magnesite, Lizard Pond South prospect. Vein in the foreground assayed 12.6 g/t gold.*

brown, siliceous, locally brecciated magnesite-altered serpentinite of the Great Bend Complex (Plate 22). The veins are up to 1.5 m thick, have strike lengths up to 9 m and contain fine-grained disseminated arsenopyrite and pyrite. Assays from the veins have returned values of up to 12.58 g/t Au over 0.4 m (Graham, 1989). Trenching and diamond-drilling results indicate a possible strike extent to the Lizard Pond vein system of 500 m to the east (Lizard Pond extension) and 350 m to the southeast (Graham, 1990).

In 1989 – 1990, BPCan drilled 14 diamond-drill holes, totalling 1157.64 m, in the vicinity of Lizard Pond. This drilling intersected a sequence of red, green and brown siltstone, grey sandstone and greywacke, variably silicified and magnesite-altered peridotite, sheared serpentinite, and serpentinized gabbro.

Graham (1989) interpreted the red and green siltstone to be Silurian and to nonconformably overlie the altered ultramafic rocks. Contacts between the siltstones and ultramafic rocks are poorly preserved and are generally either fault gouge, locally brecciated or veined. Sharp contacts are locally preserved, particularly in holes MO-89-01 (not shown) and MO-89-03 (Figure 23). The ultramafic rocks are interpreted to have been emplaced as a series of thin thrust slices separated by red siltstone (Graham, 1989).

Based on regional correlations, the red and green siltstones are interpreted to belong to either the Silurian Botwood or Indian Islands groups (L. Dickson, personal communication, 1994), but this is a tenuous correlation that lacks fossil control. Since the structurally controlled gold mineralization occurs within both siltstone and ultramafic sequence, then both the deformation and mineralization must postdate the Silurian sedimentary rocks.

In drillcore, the most significant gold mineralization is associated with the altered ultramafic rocks (Figure 23). Anomalous gold concentrations also occur within some siltstone and graphitic shale horizons as was noted in both the Atlantic Goldfields Incorporated and BPCan drilling. The ultramafic rocks are typically grey to light green or pinkish to purplish orange, intensely brecciated and strongly foliated; chromite occurs as small euhedral crystals.

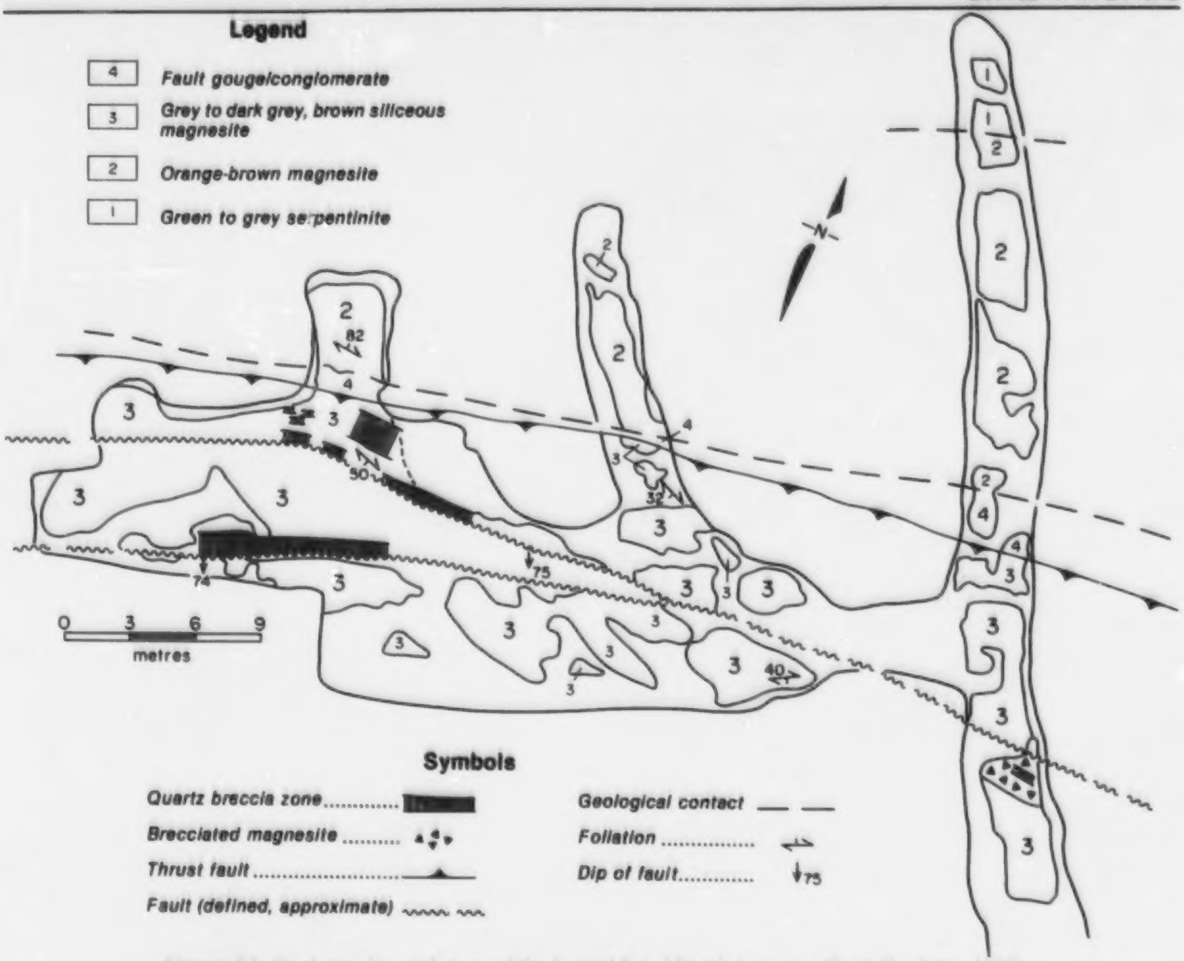


Figure 24. *Geological trench map of the Lizard Pond South prospect (from Graham, 1990).*

Plate 22. *Silicified and hematized, brecciated serpentinite, Lizard Pond South prospect. Small black flecks are chromite grains.*

Auriferous sections within the ultramafic rocks are pervasively silicified and intensely quartz and quartz – magnesite veined. The quartz veins are up to 20 cm thick but thicknesses of 2 to 3 cm are more typical. The veins are locally vuggy, chalcedonic and exhibit breccia textures. Small acicular needles of arsenopyrite and wispy patches of fine-grained, disseminated arsenopyrite and lesser pyrite occur within the veins. The arsenopyrite occurs in concentrations up to 25 percent. Disseminated sulphides are also present within the silicified wall rock adjacent to the veins. The

SEM analyses indicate that the pyrite occurs as small skeletal laths encased in arsenopyrite (Plate 23).

Plate 23. *SEM backscatter photograph of skeletal pyrite overgrown by fine-grained arsenopyrite, Lizard Pond prospect.*

Gold concentrations within the quartz veins intersected in diamond-drill holes are significantly lower than those obtained from the discovery trench. The highest values were obtained from diamond-drill holes LP-87-01 (2599 ppb Au over 1 m and 2259 ppb over 1 m) and MO-89-02 (1540 ppb Au over 0.71 m). Slightly higher gold concentrations were intersected under the Lizard Pond extension (Table 11). These analyses indicate that there is a strong Au – As association and a weaker Au – Hg association. Both Ag and Sb exhibit weak correlations with Au. Analyses from diamond-drill hole MO-89-07 indicate a weak correlation between Au and Cu, Pb and Zn (Table 11). The Lizard Pond prospect is classified as an arsenopyrite-rich quartz-vein style of gold mineralization.

52. Aztec

Location and Access

The Aztec prospect (NTS 2D/11 Au006 UTM 630650 5388950) is located approximately 1 km southwest of Greenwood Pond and 2.2 km east of the Northwest Gander River (Figure 21). An abandoned network of logging roads that originate at Glenwood provide access to the area.

Table 11. Selected diamond-drill hole assay results, Lizard Pond South prospect (from Graham, 1989, 1990)

MO-89-02

Interval (m)	Au (ppb)	Ag (ppm)	As (ppm)	Hg (ppm)	Sb (ppm)
27.12-28.12	<5	<0.2	65	<1	<5
28.12-29.12	40	<0.2	215	1	15
29.12-29.73	160	<0.2	795	5	90
29.73-29.92	180	<0.2	1300	3500	400
29.92-30.92	130	<0.2	840	3	115
30.92-31.92	160	<0.2	795	3	115
31.92-32.92	830	<0.2	1980	1	185
32.92-33.92	70	<0.2	620	<1	105
33.92-34.54	45	<0.2	1225	<1	130
34.54-35.25	670	<0.2	3060	<1	200
35.25-35.96	1540	1.2	5600	2500	500
35.96-36.67	770	1.8	3200	1500	330
36.67-37.67	120	<0.2	1200	360	360
37.67-38.67	100	<0.2	1285	<1	290
38.67-39.26	50	<0.2	580	<1	160
39.26-39.84	50	<0.2	415	2	65
39.84-40.17	520	1.2	2600	1800	225
40.17-41.22	100	<0.2	535	<1	55
41.22-42.27	35	<0.2	390	<1	35
42.27-42.54	1100	1.6	6285	2	125
42.54-43.54	35	<0.2	310	<1	50

MO-89-03

Interval (m)	Au (ppb)	Ag (ppm)	As (ppm)	Hg (ppm)	Sb (ppm)
82.23-83.23	<5	<0.2	<5	<1	<5
83.23-84.23	35	<0.2	160	<1	<5
84.23-84.86	50	<0.2	250	2500	32.0
84.86-85.52	160	<0.2	1100	2600	400
85.52-86.33	105	<0.2	780	4100	115.0
86.33-87.13	130	<0.2	470	3300	91.0
87.13-87.29	820	0.3	3500	1800	185.0
87.29-88.48	<5	<0.2	5	<1	<5

MO-89-07

Interval (m)	Au (ppb)	Ag (ppm)	Cu (ppm)	Pb (ppm)	Zn (ppm)
107.56-108.56	25	<0.2	<5	<1	<5
108.56-109.56	60	<0.2	560	<1	20
109.56-110.56	55	<0.2	250	<1	15
110.56-111.56	60	<0.2	285	<1	10
111.56-112.56	65	<0.2	250	<1	5
112.56-113.56	55	<0.2	175	<1	5
113.56-114.56	80	<0.2	310	<1	20
114.56-115.56	70	<0.2	255	<1	10
115.56-116.56	50	<0.2	135	<1	10
116.56-117.00	35	<0.2	340	210	60
117.00-117.45	620	<0.2	3500	300	190

Table 11. *Continued*

MO-90-09					
Interval (m)	Au (ppb)	Ag (ppm)	Sb (ppm)	As (ppm)	Hg (ppm)
9.58-9.83	1410	<0.2	40	2740	<1
9.83-10.78	10	1.2	5	50	<1
10.78-11.18	3020	<0.2	25	1200	<1
11.18-12.40	495	<0.2	20	1455	<1
12.40-13.40	375	<0.2	65	3660	<1
13.40-14.63	160	<0.2	75	2240	<1
14.63-16.64	260	<0.2	110	1460	1
16.64-18.64	115	<0.2	35	985	2
18.64-20.64	145	<0.2	55	1205	1
22.64-24.64	100	<0.2	65	805	1

MO-90-10					
Interval (m)	Au (ppb)	Ag (ppm)	Sb (ppm)	As (ppm)	Hg (ppm)
40.32-41.32	<5	<0.2	5	100	<1
41.32-42.32	150	<0.2	15	310	1
42.32-42.47	4240	<0.2	80	1305	1
42.47-42.84	60	0.8	25	280	2
42.84-42.96	4340	<0.2	130	2040	2
42.96-43.60	260	2.4	45	440	1
43.60-43.72	4090	<0.2	100	1545	1
43.72-44.72	215	1.4	45	470	<1
44.72-46.72	210	<0.2	55	505	<1

Exploration History

In the late 1980s, Noranda Exploration Company Limited began an extensive exploration program in the Pauls Pond area that consisted of prospecting, geological mapping, geophysical and geochemical surveys, trenching and diamond drilling (Tallman, 1989a and b). This work led to the discovery of a number of significant showings and prospects which include the Aztec, A-Zone Extension, and Goose.

Local Geology and Mineralization

Epithermal-style (Tallman, 1989a), low-grade gold mineralization was discovered by Noranda at the Aztec prospect in 1988 (Plate 24). The prospect, which has been trenched and tested with six diamond-drill holes, has been traced along strike for approximately 330 m (Figure 25). The alteration system was described as being developed at or near the presumed fault contact between the Davidsville and Botwood groups (Figure 25). The fault is described by Tallman (1989b) as a brittle, low-angle thrust, defined by a 10-m-thick graphitic gouge zone that dips shallowly to the northwest. This fault has been traced for approximately 15 km to the north.

Plate 24. *Discovery outcrop, Aztec prospect. Ridge is underlain by hydrothermal breccia; sloping beds to the left consist of pyrite-bearing conglomerate–breccia.*

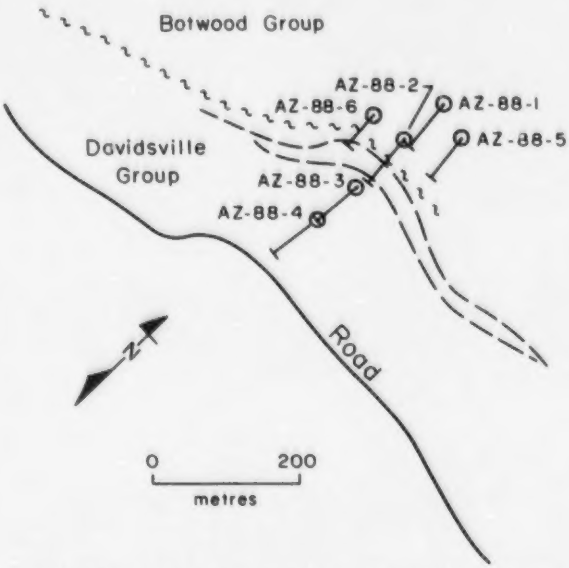


Figure 25. *Local geology and diamond-drill hole location map of the Aztec prospect (from Tallman, 1989b).*

The alteration associated with the Aztec prospect is developed in the structural footwall of this fault zone (Figure 26) and is comprised of a locally silicified, pyritic conglomerate or breccia (Plate 25). The breccia overlies (but may also be developed adjacent to) the zone described as a silica scinter by Tallman (1989b). Fragments within the conglomerate are locally silicified suggesting that the unit may have developed in part as talus breccia on the flanks of the scinter. The gold mineralization, typically <1 g/t, is associated with the conglomerate (Tables 12 and 13).

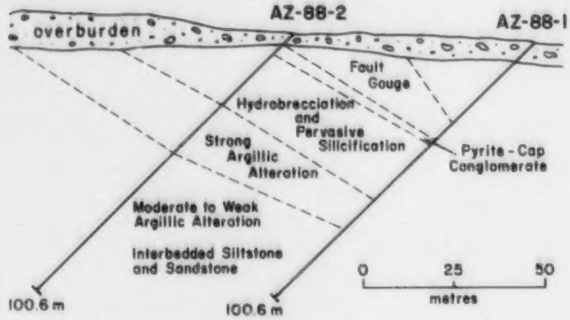


Figure 26. *Schematic cross-section through the Aztec prospect, view toward the northwest (from Tallman, 1989b).*

Table 12. Selected surface channel-sample assays from the Aztec prospect (from Tallman, 1989a)

Interval (m)	Au (ppb)
13.0	1010
6.0	1030
12.0	420
3.0	440

Spectacular multiple phase hydrothermal breccias (Plate 26) and pervasive silicification comprise the silica scinter. Breccia fragments exhibit concentric rinds of chalcedony (Plate 27), and chalcedony also forms a large portion of the breccia matrix; this unit is about 10 m thick and is well exposed on surface.

Table 13. Selected assay results obtained from diamond-drill core from the Aztec prospect (from Tallman, 1989b)

Hole	Interval (m)	Au (ppb)
AZ-88-01	38.4-39.4	610
	39.4-40.4	180
AZ-88-02	6.7-7.4	950
AZ-88-06	20.9-21.9	140
	21.9-22.5	1270
	22.5-23.0	860
	23.0-23.5	550
	23.5-24.0	270
	24.0-24.5	270

Structurally beneath this scinter is a 70-m-thick zone of argillic alteration that is variably developed in fine-grained siltstone and sandstone (Figure 26). The intensity of the alteration appears to decrease downward, but the diamond drilling did not extend into unaltered rocks. On the surface, the alteration has a strike length of 330 m, a width of 100 m and dips shallowly to the northwest (Tallman, 1989b).

The alteration and textures observed at the Aztec prospect indicate that it is representative of epithermal style of gold mineralization.

57. Goose

Location and Access

The Goose prospect (NTS 2D/11 Au011 UTM 635750 5390000) is located approximately 1.5 km southwest of Pauls Pond (Figure 21). Logging roads that originate at Glenwood lead to within 1.5 km of the prospect. A muskeg trail leads to the trenches.

Exploration History

In 1988, Noranda Exploration Company Limited prospectors discovered auriferous float, which assayed 42.1 g/t Au (Plate 28), approximately 1 km southwest of Pauls Pond (Tallman, 1989a). The prospect was trenched (subsequently backfilled) and tested by diamond drilling.

Plate 25. *Pyrite-bearing conglomerate–breccia, Aztec prospect. Fragments–clasts within the unit are angular and locally siliceous.*

Plate 26. *Multiple-stage hydrothermal brecciation and veining, Aztec prospect.*

Plate 27. *Cockade-textured hydrothermal breccia that exhibits multiple phases of brecciation and veining, Aztec prospect.*

Local Geology and Mineralization

A series of trenches exposed numerous quartz veins and veinlets developed within sericitized and weakly silicified greywacke of the Davidsville Group (Figure 27). The mineralized zone, as exposed by the trenching, has an average width of approximately 3 m and a strike length of 180 m (Tallman, 1989a); the zone is interpreted to be open in both directions.

Four diamond-drill holes totalling 291.1 m were drilled on the Goose prospect in 1988. The drilling intersected a sequence of weakly deformed, grey – green, massive sandstone, limonitic sandstone and green, weakly chloritic siltstone (Figure 27). White patchy silicification occurs throughout the sequence (Tallman, 1989a).

The gold mineralization occurs within a moderately to strongly silicified, chloritic sandstone – siltstone unit (Figure 27). The unit is cut by abundant 1- to 2-cm-wide milky-white quartz veins and veinlets. Arsenopyrite, pyrite and pyrrhotite occur both as disseminations (up to 5 to 10 percent) within the wall rock and as fine to coarse patches within the quartz veins. Arsenopyrite within the altered wall rock occurs as small randomly oriented needles and aggregates of needles. The pyrite occurs as aligned, elongate grains. Gold concentrations up to 7540 ppb over 1.0 m were intersected in diamond drilling (Table 14) and the prospect is classified as an arsenopyrite-rich quartz-vein style of mineralization.

GLENWOOD–NOTRE DAME BAY AREA

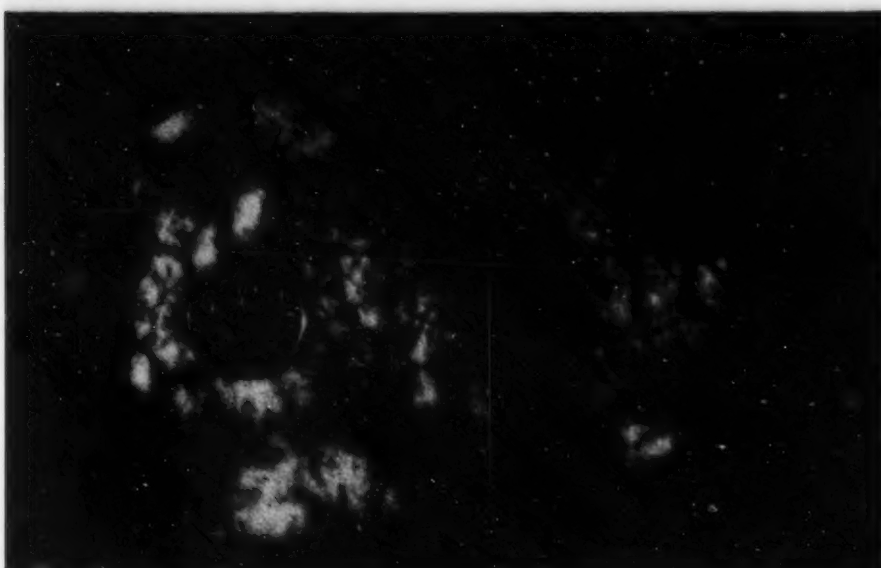


Plate 28. *Section of extensional quartz–carbonate vein float, Goose prospect. A small fleck of gold is visible along the fracture on the right side of the sample.*

Location and Access

The Glenwood–Notre Dame Bay area is located in northeastern central Newfoundland and extends from Gander Lake in the south to eastern Notre Dame Bay in the north. The area includes parts of ten 1:50 000 scale topographic map areas (NTS 2D/14, 2D/15, 2E/1, 2E/2, 2E/3, 2E/6, 2E/7, 2E/8, 2E/9 and 2E/10).

Access to the area is provided by the Trans-Canada Highway (Route 1) and Gander Bay (Route 330) highway, and by an extensive net-

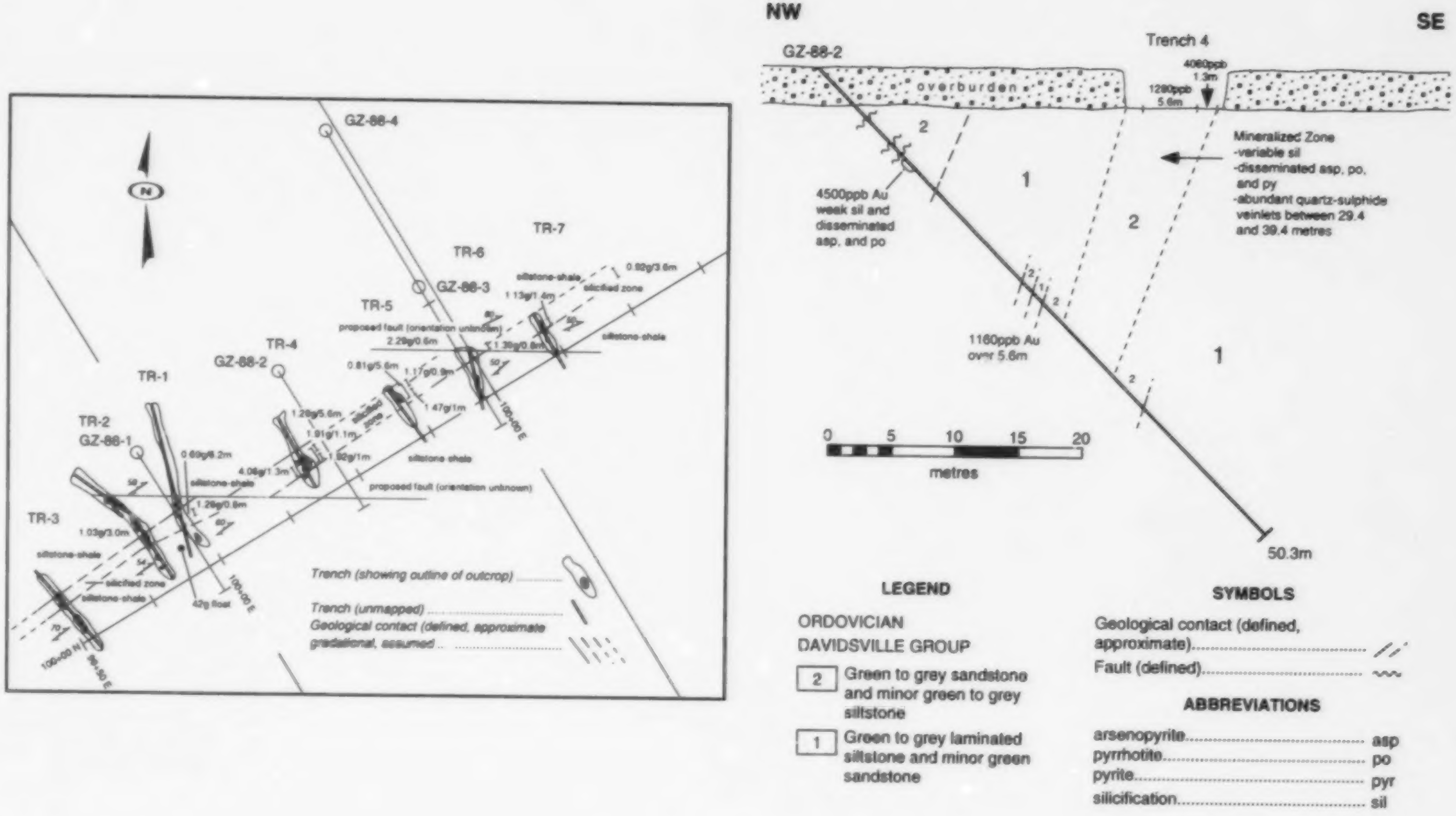


Figure 27. *Geological map showing trench and diamond-drill hole locations and diamond-drill section, Goose prospect (from Noranda Exploration Company Limited, 1988, and Tallman, 1989a).*

Table 14. Selected diamond-drill core assay results from the Goose prospect (from Tallman, 1989a)

Hole	Interval	Au (ppb)
GZ-88-01	26.2-28.7	3140
GZ-88-02	9.7-10.7	7540
	28.6-33.2	1190
	29.6-32.4	1640
GZ-88-03	21.45-31.25	930
	24.4-23.7	1890
GZ-88-04	81.0-84.0	760
	82.0-83.0	1400

work of forest access roads that lead north and south from Glenwood and south from the Gander Bay and Horwood areas. The region is characterized by gently undulating topography containing heavily forested tracts, large cutover areas, long narrow lakes and extensive bogs. The north to northeast trend of the numerous lakes and streams reflects the strong bedrock lithological and structural control on their orientation. Glacial till covers the entire region resulting in limited bedrock exposure.

Regional Setting

Geological mapping within the northeastern Dunnage Zone is continuing to uncover the many stratigraphic and structural complexities of the area. The regional geology of the Glenwood–Notre Dame Bay area can be described in terms of five main rock groupings: 1) Cambro-Ordovician shelf facies rocks (semipelite, pelite and psammite) of the Gander Zone; 2) Cambro-Ordovician ophiolitic rocks of the Gander River Complex; 3) early Paleozoic island-arc and back-arc derived sedimentary and volcanic rocks (e.g., Davidsville and Exploits groups, Dunnage Melange, Sampson Greywacke and the Goldson Conglomerate); 4) post-accretion Silurian sedimentary and volcanic rocks (Botwood and Indian Islands groups; and 5) Siluro-Devonian intrusive rocks (e.g., Mount Peyton Intrusive Suite)

A brief review of the regional geology concentrates on those units that host most of the known epigenetic gold occurrences (i.e., Gander River Complex, Davidsville, Botwood and Indian Islands groups and the Mount Peyton Intrusive Suite; Figure 28)

The boundary between the Dunnage and Gander zones is marked by the discontinuous belt of ophiolitic rocks of the Gander River Ultrabasic Belt (Jenness, 1958; Blackwood, 1982) now referred to as the Gander River Complex (O'Neill and Blackwood, 1989). To the east of this belt, shelf-facies semipelitic, pelitic and psammitic rocks of the Gander Zone are exposed. These rocks are interpreted to pass westward (locally conformably) into rocks of the Middle Ordovician Davidsville Group (Blackwood, 1982). The Davidsville Group formed as a distal back-arc turbidite sequence derived from the volcanic arcs to the west, and deposited unconformably upon an ophiolitic basement (Gander River Complex; Blackwood, 1982).

The post-accretion Botwood and Indian Islands groups conformably overly the early Paleozoic sequences. The Botwood Group is comprised of grey and red, locally micaceous, sandstone, minor fossiliferous calcareous beds, siltstone, conglomerate and subaerial mafic and felsic volcanic rocks. Blackwood (1982) interpreted the Botwood Group to be conformable on the Davidsville Group, representing a transition from submarine fan to deltaic environments. The Indian Islands Group comprises phyllitic slates, quartzitic sandstones, calcareous sandstone, thin limestone lenses, conglomerate (Baird, 1958) and minor felsic volcanic rocks (Patrick, 1956).

Recent studies by Williams (1993) and Currie (1993) indicate that Silurian rocks in the Comfort Cove (NTS 2E/7) and Gander River (NTS 2E/2) areas actually comprise two contrasting sequences that are separated by a tectonic boundary called the Dog Bay Line. Northwest and west of this line, the Silurian sequence of terrestrial volcanic and sedimentary rocks is assigned to the Botwood Group. To the southeast and east, the Silurian rocks are included in the Indian Islands Group (Figure 28).

In coastal sections, the Dog Bay Line is marked by a melange of presumed Ordovician gabbro and volcanic rocks in a sheared, dark shale matrix (Williams, 1993). The Dog Bay Line has been traced for approximately 70 km southward from the Indian Islands to Glenwood and exhibits dextral offset in the order of tens of kilometres (Williams *et al.*, 1993). The Silurian sedimentary rocks in the Glenwood area have tentatively assigned to the Indian Islands Group.

Abundant small, fine- to medium-grained, intrusive gabbroic bodies are concentrated near the contact of the Davidsville and Botwood groups. These intrusions are generally undeformed except were they have been affected by shearing along the north and northeast-trending shear zones. The gabbros are interpreted to be Siluro-Devonian in age (Blackwood, 1982), and are probably related to the Mount Peyton batholith to the south.

Regional Deformation and Metamorphism

Regional deformation, metamorphism, plutonism and reactivation of the major fault systems during the Late Silurian to Early Devonian resulted in intense deformation and plutonism within the eastern Dunnage Zone. Rocks of both the Davidsville and Botwood groups exhibit a regional, northeast-trending, penetrative cleavage that is axial planar to isoclinal folds and within the Davidsville Group this cleavage

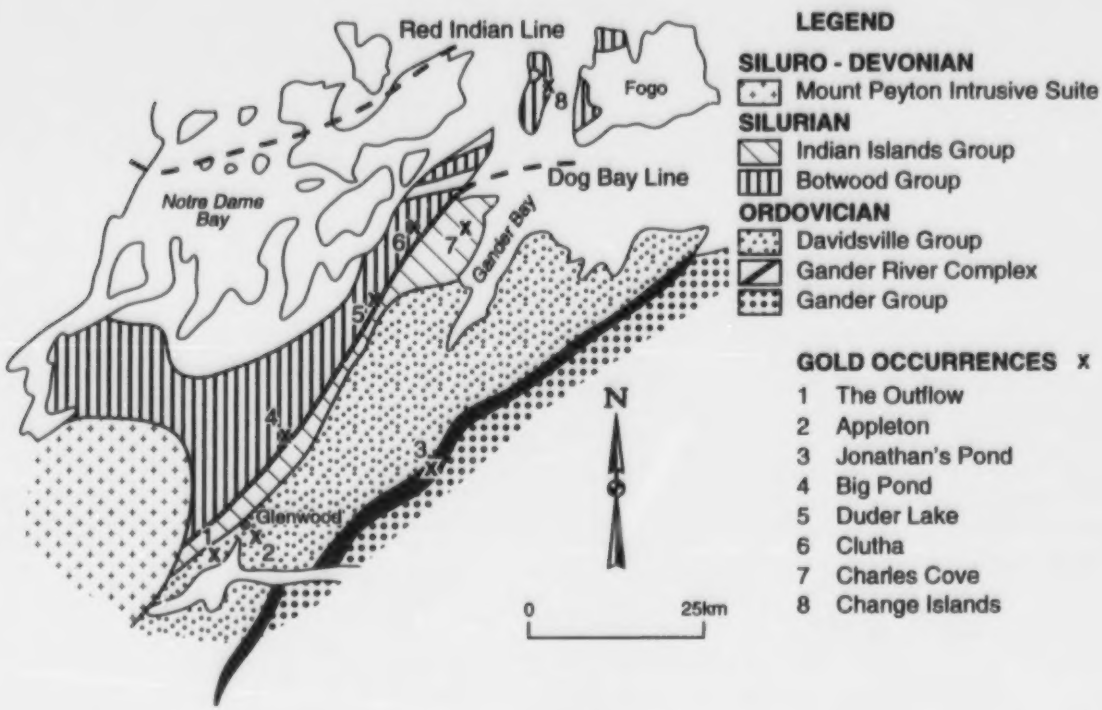


Figure 28. *Simplified geological map of the Glenwood – Notre Dame Bay area showing the distribution of the geological units and the significant gold occurrences discussed in the text.*

is quite slaty. Second-phase deformation structures within the Davidsville Group comprise small conjugate kink bands and minor open to moderately tight, gently southward-plunging folds that fold the F_1 cleavage (Blackwood, 1982). The rocks have been subjected to lower greenschist-facies metamorphism.

Previous Work

The first recorded geological investigation in the area was undertaken by Alexander Murray and J.P. Howley (Murray and Howley, 1881). These workers examined the geology along eastern Notre Dame Bay, the Gander River system and Gander Lake. Murray and Howley (1881) also reported the first known occurrence of gold mineralization within the area and state that, "distinct traces of this precious metal were ascertained in a quartz vein cutting the silky, bluish slates on the S.W. Gander River in 1876." Murray and Howley (1894) also reported that innumerable quartz veins, which looked promising for gold mineralization, were exposed along the railway line north of Gander Lake.

A number of significant regional studies have been completed within the Glenwood–Notre Dame Bay area. Chromite mineralization associated with the ultrabasic rocks, to the east of the Gander River, was examined by Snelgrove (1934) as part of a study of the chromite deposits of Newfoundland.

Twenhofel and Shrock (1937) examined the Silurian rocks exposed along Hamilton Sound, particularly within the Dog Bay (Horwood Bay) area. Patrick (1956) proposed that these rocks extended southwestward into the Second Pond area. Baird (1958) referred to these and similar rocks exposed on islands in Hamilton Sound as the Indian Islands Group. Earlier, Twenhofel (1947) proposed that the sequence of phyllites, slates, argillites and quartzites exposed on the shores of Gander Lake be designated the Gander Lake Series.

In 1951, the Photographic Survey Corporation Limited conducted geological reconnaissance mapping of east-central Newfoundland for the Newfoundland Government (Baird *et al.*, 1951). This work covered a belt extending south from Hamilton Sound to Baie d'Espoir. Baird *et al.* (1951) reported an occurrence of native gold reported by the Independent Mining Corporation. The gold, associated with sphalerite, molybdenite, fine-grained pyrite and vuggy quartz hosted by greywacke, was reported to be located three quarters of a mile south of Middle Ridge Pond.

Jenness (1954, 1958) defined the Gander River Ultrabasic Belt and the Gander Lake Group. The Gander Lake Group, which was proposed to replace the Gander Lake Series of Twenhofel (1947), was subdivided into lower, middle and upper units (Jenness, 1963). Later, regional 1:250 000-scale mapping of the area was undertaken by the Geological Survey of Canada (Williams, 1967; Anderson and Williams, 1970).

Kennedy and McGonigal (1972) redefined the Gander Lake Group to include only the pelitic, semipelitic and psammitic rocks (the lower unit of Jenness, 1963) located to the east of the Gander River Ultrabasic Belt. They defined the fossiliferous Middle Ordovician slates, siltstones and greywackes (the middle and upper units of Jenness, 1963), which are developed to the west of the Gander River Ultrabasic Belt, as belonging to the Davidsville Group. The contact between the Davidsville Group and the Gander River Ultrabasic Belt was described by Kennedy (1975) as an unconformity and later, the Gander Lake Group was renamed Gander Group by Blackwood (1982), following McGonigal (1973).

The Geological Survey of Canada has conducted 1:50 000-scale mapping of the Comfort Cove, NTS 2E/7 (Williams, 1993; Currie, 1993) and Carmanville, NTS 2E/8 (Currie *et al.*, 1980) map areas. The Newfoundland Department of Mines and Energy has conducted systematic 1:50 000-scale mapping of much of the northeastern Dunnage Zone (NTS 2D/14 (Dickson, 1993); NTS 2D/15 (Blackwood, 1982; O'Neill, 1990); NTS 2E/1 (O'Neill, 1987, 1981; O'Neill and Knight, 1988; Colman-Sadd, 1994); and NTS 2E/6 (O'Brien, 1991)).

Blackwood (1982) interpreted that rocks of the Gander River Ultrabasic Belt, to the north of Gander Lake, are in fault contact with rocks of the Gander Group. To the south of Gander Lake, where the Gander River Ultrabasic Belt is not continuously exposed, Blackwood (1982) interpreted the contact between the Davidsville and Gander groups to be conformable. The contact between the Davidsville and Botwood groups was described as probably conformable. Blackwood (1979, 1982) reported that arsenopyrite and pyrite-bearing quartz veins, developed within intensely sheared gabbro northeast of Jonathans First Pond, assayed 6 g/t gold.

O'Neill (1987) reported that the basal Davidsville Group in the Weir's Pond area is structurally interleaved with the Gander River Ultrabasic Belt. Also, he reported the presence of minor gold mineralization in a small granite intrusion within the Davidsville Group and in mineralized quartz veins in psammitic and semipelitic rocks of the Gander Group, and he suggested that the talc – carbonate alteration associated with the rocks of the Gander River Ultrabasic Belt is similar to that associated with the listwaenite model of Buisson and LeBlanc (1985).

O'Neill and Blackwood (1989) proposed a revised stratigraphic nomenclature for the Gander and Davidsville groups and the Gander River Ultrabasic Belt. They subdivided the Gander Group into the Jonathans Pond and Indian Bay Big Pond formations, and the Davidsville Group into the Weir's Pond, Hunt's Cove and the Outflow formations. The Gander River Complex was proposed to replace the Gander River Ultrabasic Belt.

The area was included in a regional lake-sediment geochemical survey by the Newfoundland Department of Mines and Energy (NTS 2E, Davenport and Nolan, 1988; NTS 2D, Davenport *et al.*, 1988). This survey showed the distribution of a wide range of elements including Au, Sb and As. This data has proved valuable to companies in defining exploration targets, particularly in previously unexplored areas.

Exploration within the northeastern Dunnage Zone has occurred in three phases. Prior to 1970, the emphasis was mainly restricted to exploration for chromite and asbestos associated with ultramafic rocks of the Gander River Complex. The Newfoundland and Labrador Corporation Limited (NALCO) had held concession rights to much of the area from 1951 to 1980 and had earlier conducted extensive prospecting of the Gander River Complex (Dunlop, 1955).

Between 1970 and the early 1980s, the emphasis shifted to base-metal exploration as a number of companies concentrated on the volcanic rocks associated with the Gander River Complex. International Mogul Mines Limited optioned a portion of the NALCO ground during the 1970s and discovered a number of small base-metal showings that were subsequently drilled.

In the early 1980s, following the discovery of quartz-vein-hosted gold mineralization near Jonathans Pond (Blackwood, 1979, 1982) the emphasis in exploration shifted once again, this time to gold. Since then, a number of companies have been active in the area (e.g., Westfield Minerals, Duval International Limited, Esso Minerals Limited, Gander River Minerals, Esso Resources Canada, Falconbridge Limited and Noranda Exploration Company Limited (joint ventures with Noront Resources Limited and Springer Resources Limited)). Also Noranda Exploration Company Limited has been active, particularly in the Botwood and Davidsville groups, having made a number of significant gold discoveries through a combination of regional prospecting and geochemical soil- and lake-sediment sampling.

Gold Occurrences

73. The Outflow

Location and Access

The Outflow prospect (NTS 2D/15 Au001 UTM 653550

5422550) is located on the western side of the Gander Lake Outflow approximately 6.5 km south-southwest of Glenwood (Figure 28). An abandoned logging road, originating at Glenwood, leads to the area.

Exploration History

In 1987, gold mineralization was discovered at The Outflow by Noranda Exploration Company Limited prospectors. Detailed mapping, trenching and diamond drilling (12 holes totalling 1007.6 m) by Noranda has outlined anomalous mineralization over a strike length of 5 km (Gower and Tallman, 1988; Figure 29).

Local Geology and Mineralization

The mineralization is developed within greywacke lenses that are part of a sequence of shale, siltstone, sandstone, greywacke and minor conglomerate of the Davidsville Group (Figure 29). Gower and Tallman (1988) described the sequence as being isoclinally folded with an associated strongly developed, penetrative cleavage which has been deformed by upright to slightly inclined open folding. North-trending brittle faults cut the sequence.

Two mineralized zones termed the Mustang and Piper zones, with strike lengths of 1.8 km and 750 m respectively, have been outlined (Figure 29) (Gower and Tallman, 1988). The gold is associated with pyrite, arsenopyrite, stibnite and intense silicification.

Three styles of related silicification have been documented (Gower and Tallman, 1988): 1) spectacular hydrobreccia stockwork (Plate 29); 2) pervasive silicification; and 3) massive crystalline quartz and quartz – carbonate veins. Gower and Tallman (1988) have shown that the Mustang Zone is comprised of all three styles of silicification and contains up to 3 percent stibnite and pyrite. Intense hydrobrecciation, quartz veining and local pervasive silicification characterize the Piper Zone (Gower and Tallman, 1988).

Both zones trend northeast – southwest and dip to the northwest. However, the Mustang Zone appears to dip to the southeast at its southwest end (Gower and Tallman, 1988). A channel sample from the Mustang Zone assayed 12.23 g/t gold; gold values are typically <1 g/t (Gower and Tallman, 1988). Assay results from diamond-drill hole GO-88-01 (Figure 30) are presented in Table 15, similar results, although not presented here, were obtained from most of the other diamond-drill holes. Gold values for the Piper Zone are typically <1 g/t.

Textures such as the intense hydrobrecciation and vuggy quartz veining observed at The Outflow suggest high level mineralizing processes more akin to epithermal systems. Tallman (1990a) suggested that the relatively high concentrations of stibnite associated with The Outflow prospect may indicate that it formed in the higher levels of a hydrothermal system, which at deeper levels may have developed antimony mineralization similar to the Hunan and related prospects.

Appleton Prospects

Location and Access

The Bullet and The Knob prospects are located approximately 1.2 km west of the Glenwood Provincial Park entrance and 0.3 km south of the Trans-Canada Highway (Figure 31). A logging road, located 1.3 km west of the park, passes within 100 m of the prospects (Plate 30). A third prospect, the Bowater, (Appendix 2) is located immediately south of the community of Appleton.

Exploration History

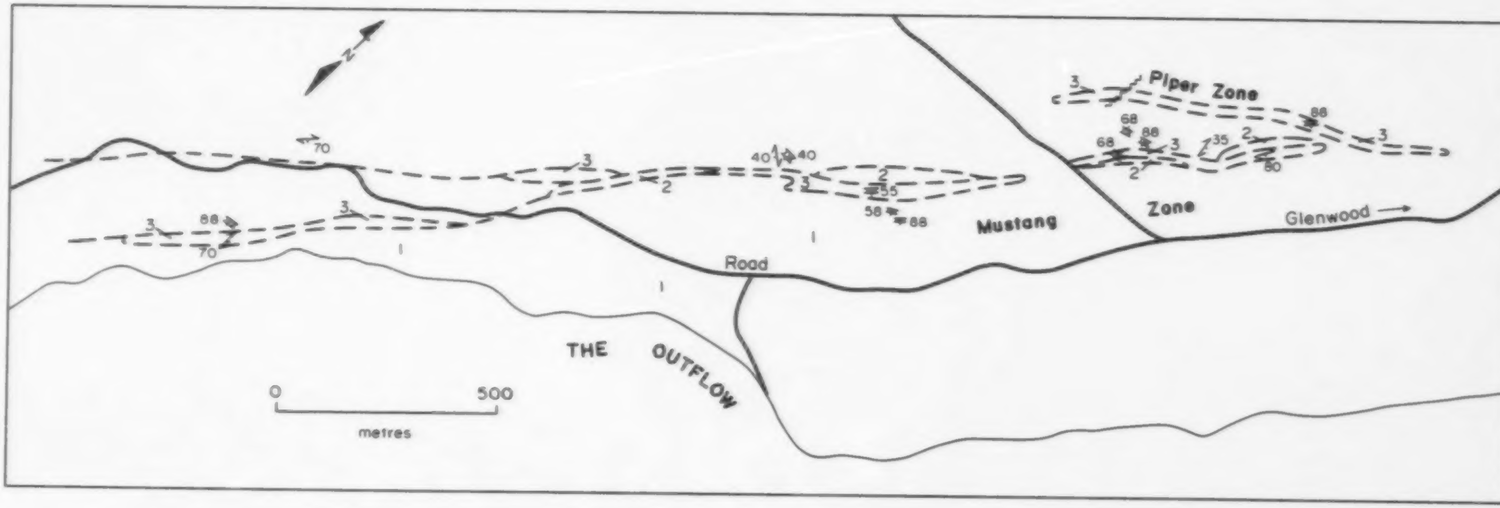
Noranda Exploration Company Limited discovered visible gold mineralization at the Bullet prospect in 1987 (Gower and Tallman, 1989). The prospect was trenched and tested with three diamond-drill holes. Subsequent work by Noranda in the fall of 1990 resulted in the discovery of spectacular quartz-vein-hosted gold mineralization at the Knob prospect (Collins, 1991). Recent trenching has further uncovered the structurally complex vein system (D. Sheppard, personal communication, 1992). The Knob – Bullet area is currently an active exploration project, assessment reports are still confidential and descriptions of the mineralized veins and geological setting are limited.

74. Bullet

Local Geology and Mineralization

The Bullet prospect (NTS 2D/15 Au002 UTM 657600 5425700) is hosted by slightly graphitic, greyish-green shales and siltstone of the Davidsville Group. The gold mineralization comprises a narrow, quartz – carbonate vein set (Plate 31, Figure 32) developed within a northeast-trending, steeply south dipping, dextral shear zone. The shear zone has a maximum width of 50 cm and an exposed strike length of 24 m. The shear dies out quickly toward the northeast and to the southwest, the shear and quartz veining are offset approximately 1 m by a sinistral shear zone. Movement along this zone appears to have been coincident with quartz vein development as the vein cuts this shear and was offset by and folded into, the plane of the shear. There appears to have been late movement on the shear that hosts the main quartz veins as these veins are broken and reoriented (Figure 32).

The quartz veins are generally less then 15 cm thick and comprise milky-white quartz having disseminated pyrite, arsenopyrite, boulangerite and minor base metals. The gold



LEGEND

MIDDLE ORDOVICIAN
Davidsville Group

3 *Intense hydrothermal brecciation, silicification, quartz veining and localized stringer pyrite and disseminated pyrite, arsenopyrite and stibnite*

2 *Greywacke*

1 *Shale, siltstone and minor sandstone*

SYMBOLS

cleavage (dip known)

fault (defined)

quartz vein or stockwork (dip known)

geological contact (approximate)

Figure 29. *Geology of the Outflow area (from Gower and Tallman, 1988).*

Plate 29. *Intense hydrothermal brecciation developed within greywacke, The Outflow prospect. Angular wall-rock fragments are coated with quartz rinds.*

occurs as specks and clusters of free gold, locally overgrowing boulangerite (Plates 32 and 33). Channel- and grab-sample assay results include 11.9 g/t Au over 0.5 m, 43.2 g/t Au over 0.8 m, 456 g/t Au, 702 g/t Au, 28.7 g/t Au and 78.4 g/t (Gower and Tallman, 1989). Selected diamond-drill assay results are presented in Table 16. The prospect is considered to be a pyrite – arsenopyrite-rich quartz-vein style of gold mineralization.

76. The Knob

Local Geology and Mineralization

The auriferous quartz veins (NTS 2D/15 Au004 UTM 657350 5425650) are developed within a variably deformed

Table 15. Selected diamond-drill core assay results from the Mustang zone, The Outflow prospect (data from Gower and Tallman, 1989a, 1990)

Hole #	Interval (m)	Au (ppb)
GO-88-01	21.6-22.1	3700
	22.1-22.7	2550
	23.1-24.0	1170
	24.0-25.0	1290
	25.6-26.0	565
	26.0-27.0	1110
	27.0-28.0	655
	28.0-28.5	620
	28.5-28.8	1060
	28.8-29.35	1150
	29.35-29.65	2030
	29.65-30.4	880
	30.4-30.7	3250
	30.7-31.65	695
	31.65-31.9	2080
	31.9-32.9	1250

northeast-trending greywacke unit of the Davidsville Group (Plate 34, Figure 33). The greywacke is in fault contact with an unmineralized and visibly unaltered sequence of shale. The shale dips steeply to the northwest and forms the structural footwall to the mineralized package. Faulting also appears to have offset the mineralized veins.

Two types of quartz veins are present: 1) pyrite – arsenopyrite-rich veins that contain low values of gold, and 2) milky-white massive and smaller sheeted quartz veins (Plate

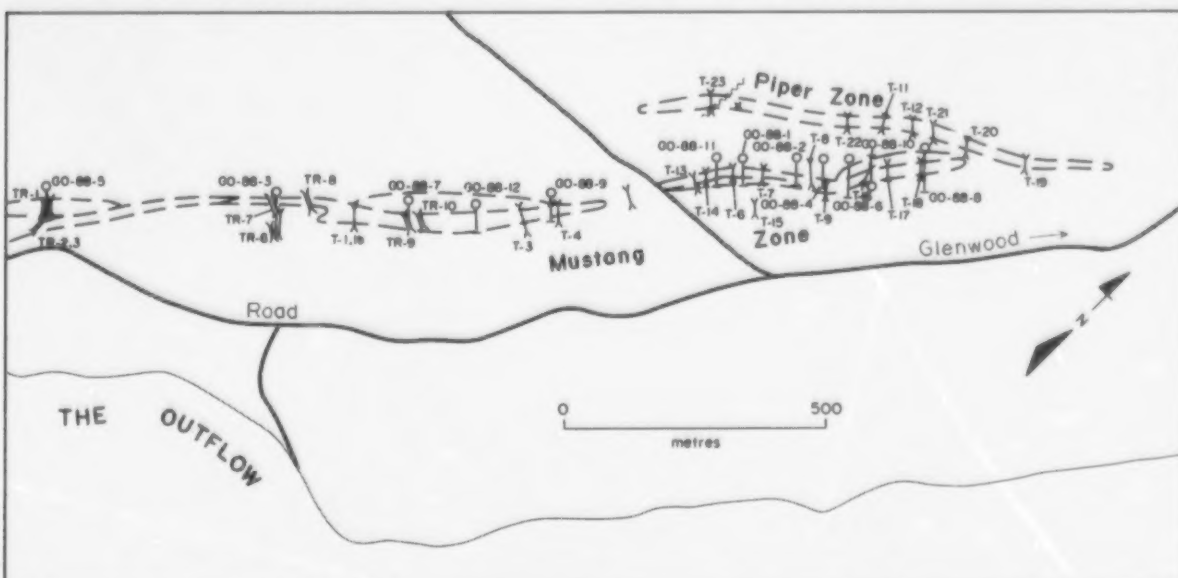


Figure 30. *Diamond-drill hole and trench location map, The Outflow prospect (from Gower and Tallman, 1988).*

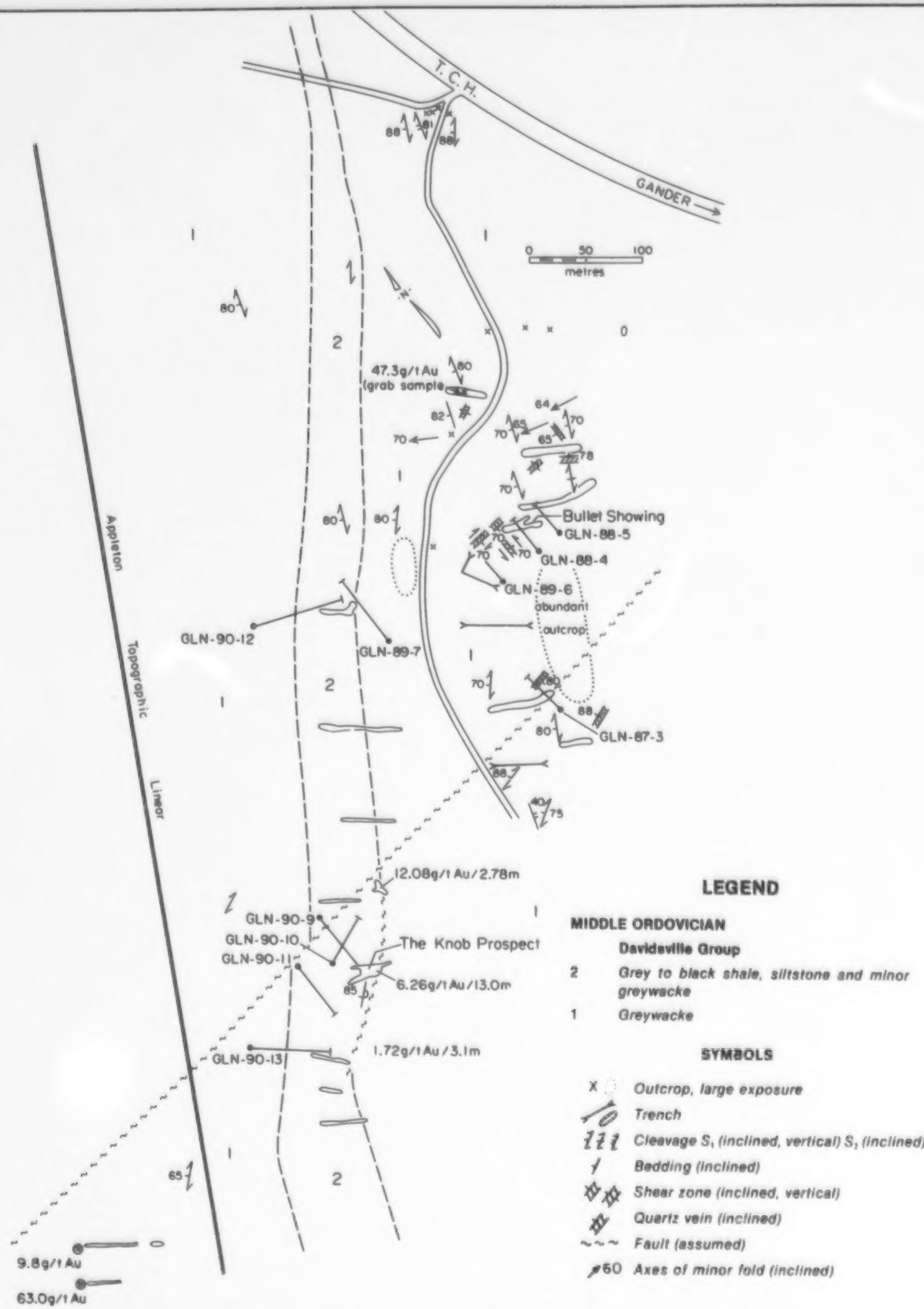


Figure 31. *General geology of the Bullet and the Knob prospects (from Gower and Tallman, 1989, and Collins, 1991). Also shown are trench and diamond-drill hole locations.*

Plate 30. *Aerial view to the northeast, Appleton gold prospects. The Knob prospect is exposed in the large trench right of centre, middle foreground; the Bullet prospect is exposed in the trench located to the right of the road. The Appleton linear corresponds with the valley located on the left side of the photograph.*

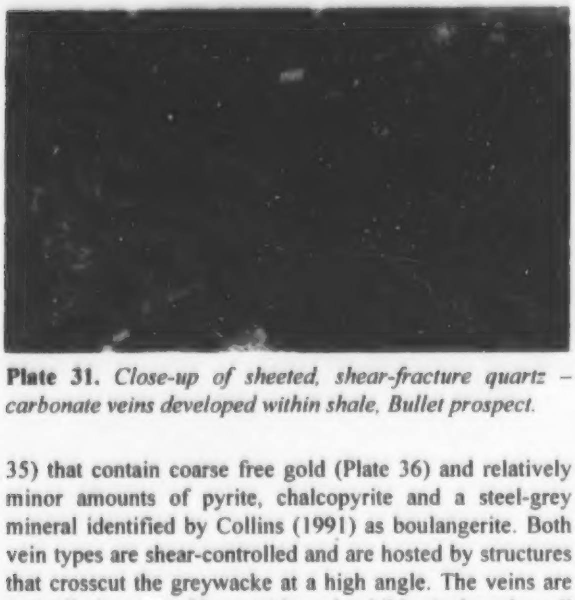


Plate 31. *Close-up of sheeted, shear-fracture quartz – carbonate veins developed within shale, Bullet prospect.*

35) that contain coarse free gold (Plate 36) and relatively minor amounts of pyrite, chalcopyrite and a steel-grey mineral identified by Collins (1991) as boulangerite. Both vein types are shear-controlled and are hosted by structures that crosscut the greywacke at a high angle. The veins are typically less than 50 cm wide and exhibit pinch-and-swell textures. It is not known if or how the two types of veins are related. Extensional veins (tension-gash veins) are also developed within the greywacke within and adjacent to the main shear zones (Plate 37). Assay results from trenching and diamond drilling are presented in Tables 17 and 18 respectively.

Wall-rock alteration around the milky-white veins comprises both silicification with disseminated pyrite and arsenopyrite, and intensely deformed rusty weathering zones (Plate 37). The Knob prospects are classified as pyrite – arsenopyrite-rich quartz vein style of gold mineralization.

Figure 32. *Trench map of the Bullet prospect showing the brecciation of the quartz veins, the shear zone that hosts the veins and the sinistral shear that offsets the mineralized shear (from Evans, 1991).*

Plate 32. *SEM backscatter photo of gold grains and boulangerite within quartz, Bullet prospect.*

Plate 33. *SEM backscatter photo showing close-up of gold grain and zones boulangerite. Galena occupies the central portion of the boulangerite crystal. The gold appears to have overgrown the boulangerite.*

Table 16. Diamond-drill core assays from the Bullet prospect (data from Gower and Tallman, 1989).

Hole #	Interval (m)	Au (ppb)
GLN-88-04	13.0-17.0	870
	13.0-15.5	1140
	28.0-32.0	1134
	29.0-30.0	4050
GLN-88-05	39.3-41.1	460
GLN-89-06	39.3-39.6	17 300
	42.7-44.6	460
	46.0-48.0	4400
	46.0-46.7	8970

Plate 34. *Shear-zone controlled auriferous quartz veins developed within sheared greywacke, the Knob prospect.*

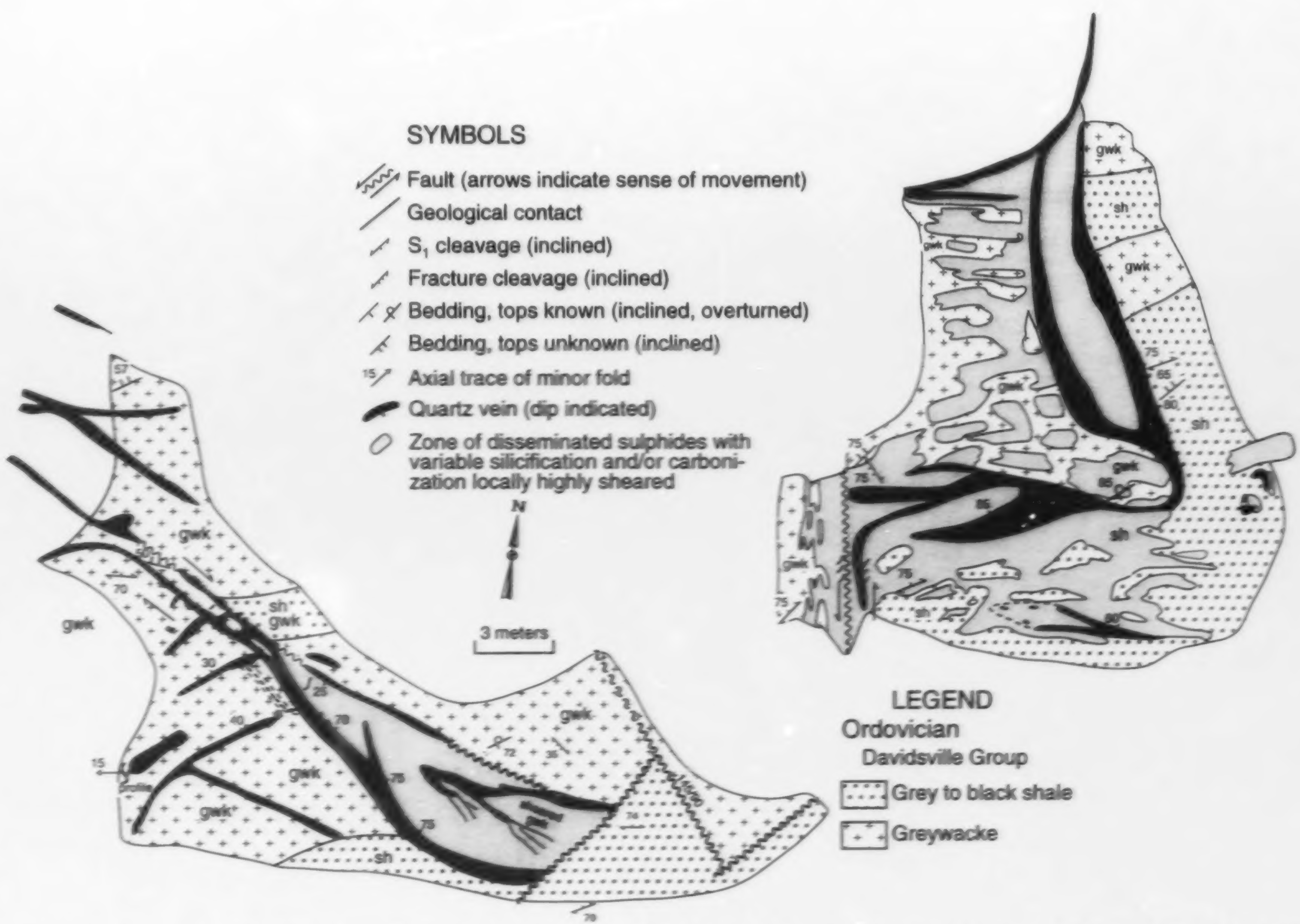


Figure 33. *Geological map of The Knob prospect illustrating the complex distribution of mineralized quartz veins (from an unpublished Gander River Minerals Limited map, produced by Dean Sheppard, 1993, and further additions by D. Evans in 1993).*

Plate 35. *Sheeted shear-fracture veins developed within sheared greywacke, the Knob prospect. The veins are crosscut by later extensional veins. The large vein contains abundant fine disseminations and coarse clots of gold.*

Table 17. Selected channel sample assay results from the Knob prospect (from Collins, 1991)

Trench #	Interval (m)	Au (g/t)
T-90-01	13.00 (sheared greywacke)	6.26
	0.81 (quartz vein within the sheared greywacke)	81.53
T-90-01A	3-4 (sheared greywacke)	1.72
	3-4 (sheared greywacke)	1.05
T-90-01B	2.78 (sheared greywacke)	12.08
	0.60 (quartz vein within sheared greywacke)	631.34

Plate 36. *Close-up of quartz sample collected from the large vein in Plate 35. Three clusters of gold are visible in the photograph.*

Plate 37. *Tension-gash veins developed within sheared greywacke, the Knob prospect. Sense of movement is dextral.*

Table 18. Diamond-drill core assay results from the Knob prospect (from Springer Resources Limited, Press Release, 1991)

Hole #	Interval (m)	Au (oz/t)
GLN-90-11	35.85-42.30	1.124
	40.00-42.30	3.092
	40.00-40.58	12.015
GLN-90-13	16.90-19.50	0.580
	17.90-19.50	0.939

81. Jonathan's Pond

Location and Access

The Jonathan's Pond prospect (NTS 2E/02 Au001 UTM 677750 5440150) is located approximately 4 km northwest of the entrance to the Jonathan's Pond Provincial Park. An abandoned logging road and skidder trail lead to the prospect.

Exploration History

Gold mineralization was first discovered in the Jonathan's Pond area by Blackwood (1979, 1982). The area was staked by Westfield Minerals Limited in 1980 (Gagnon, 1981). The company conducted soil- and stream-sediment sampling, mapping, prospecting, trenching and carried out EM-16 surveys.

The Jonathan's Pond area was subsequently staked by Noranda Exploration Company Limited in 1984 after a regional till-sampling program outlined anomalous gold values (MacKenzie, 1985). The company conducted extensive exploration work consisting of geological mapping, geophysical and soil geochemical surveys, trenching and diamond drilling. This work was hindered by extensive, thick overburden and limited exposure (McKenzie, 1985; Snow, 1988).

High concentrations of gold grains occur within the tills throughout the Jonathan's Pond area (McKenzie, 1985; Snow, 1988). In 1988, Noranda Exploration Company Limited conducted an extensive overburden drilling program as an attempt to define the source of this gold. This project delineated at least two distinct glacial tills within the Jonathan's Pond area (Simpson, 1989); the oldest till comprises a westerly derived compact, grey till, which is overlain by a southerly derived, brown sandy till.

Simpson (1989) indicated that gold grains recovered from the older till were typically corroded and that some of the grains were weakly anomalous in silver. The younger till contained fresher grains, which had anomalous silver concentrations. A number of target areas were identified, trenched and tested with five diamond-drill holes (Simpson, 1990). Results were described as not encouraging. The source of these grains has not been determined.

Local Geology and Mineralization

The Jonathan's Pond prospect is hosted by fine- to medium-grained gabbro and chloritized mafic volcanic rock of the Gander River Complex (Figure 34). A weak north-northeast penetrative fabric is developed in the gabbro. Serpentinized and talc – carbonate altered ultramafic rocks are exposed in a trench to the north, and are interpreted to be in fault contact with the gabbro.

Blackwood (1982) described the discovery outcrop as consisting of pyrite- and arsenopyrite-bearing quartz veins developed within intensely sheared gabbro. These veins contained local concentrations of massive pyrite, arsenopyrite and cubic pyrite and rhombic arsenopyrite crystals 2 to 5 mm across. A grab sample collected from the showing assayed 6 g/t Au (Blackwood, 1982).

Trenching conducted by Westfield Minerals Limited in 1984 and Noranda Exploration Company Limited in 1987 exposed the showing (Figure 35). The gold mineralization occurs as shear-zone controlled and extensional fracture veins, which contain pyrite- and arsenopyrite-bearing, milky-white, locally vuggy quartz (Plate 38). The veins are up to 15 cm thick and form a stockwork-like network concentrated in a zone approximately 3 m wide. Pyrite and arsenopyrite within the quartz veins are generally fine grained and disseminated, but coarse sulphides are developed locally. Minor to intense silicification, locally abundant disseminated pyrite and arsenopyrite and minor carbonate alteration accompanies the quartz veining. Assay results obtained from the Westfield Minerals Limited trenches are presented in Table 19.

In 1987, Noranda Exploration Company Limited drilled three short diamond-drill holes in the Jonathan's Pond area (Snow, 1988). Hole JP-87-01 was drilled beneath the main trench and intersected variably silicified and carbonatized gabbro. The gabbro is cut by numerous quartz – carbonate veins and veinlets that contain up to 15 percent pyrite – arsenopyrite. Assays indicated that the zone has weakly anomalous gold values (Snow, 1988). The prospect is a pyrite – arsenopyrite-rich quartz-vein style of gold mineralization.

82. Big Pond (Blue Peter)

Location and Access

The Big Pond prospect (NTS 2E/02 Au002 UTM 657750 5441300) is located approximately 15 km north-northeast of the Trans-Canada Highway and the Salmon Pond forest access road leads directly to the prospect.

Exploration History

Spectacular visible gold mineralization was discovered at Big Pond in 1988 by Noranda Exploration Company Limited. The company conducted soil, till and silt geochemical and magnetic and VLF-EM surveys (Tallman, 1989d, 1990c). A single trench was excavated (since backfilled) and three diamond-drill holes, totalling 246.4 m, were completed on the prospect.

Local Geology and Mineralization

The area is blanketed by extensive glacial overburden. Sporadic outcrops consist of red micaceous sandstone of the Botwood Group and gabbro (Figure 36). Exposed in the trench is an outcrop of fine- to medium-grained gabbro (Plate 39, Figure 37), which is variably Fe-carbonate altered, sericitized and weakly silicified. It is intrusive into maroon and green, bioturbated siltstone and sandstone that are exposed at the southern end of the trench. A number of similar gabbro bodies occurred along strike to the northeast and southwest.

The bioturbated siltstone and sandstone were originally interpreted to belong to the Botwood Group (Tallman, 1989d; Evans, 1991). However, these sedimentary rocks are not typical of the Botwood Group. Regional correlations (B. O'Brien, personal communication, 1993) suggest that these rocks are similar to rocks occurring either at the top of the Samson greywacke or at the base of the Indian Islands Group.

LEGEND

DAVIDSVILLE GROUP

10 *Grey to black slate and siltstone; minor red slate and minor sandstone*

9 *Fine to coarse grained grey sandstone with pebble lenses, calcareous siltstone; minor red sandstone, limestone (marble), quartzite, and grey to black slate*

8 *Fine to coarse grained polymictic (locally oligomictic) conglomerate and minor sandstone*

EARLY ORDOVICIAN OR EARLIER

GANDER RIVER COMPLEX

7 *Quartz and/or feldspar porphyry, locally brecciated*

6 *Fine to coarse grained trondhjemite, locally brecciated*

5 *Mafic flows; including pillowed, porphyritic, and amygdaloidal varieties*

4 *Fine to coarse grained gabbro; including minor diorite, tonalite and basalt*

3 *Serpentinite, magnesite and talc-tremolite schist; including minor pyroxenite*

2 *Medium to coarse grained pyroxenite; including minor serpentinite, magnesite, amphibolite, hornblende and gabbro*

GANDER GROUP

1 *Psammite and semipelite; including minor mafic tuff bands*

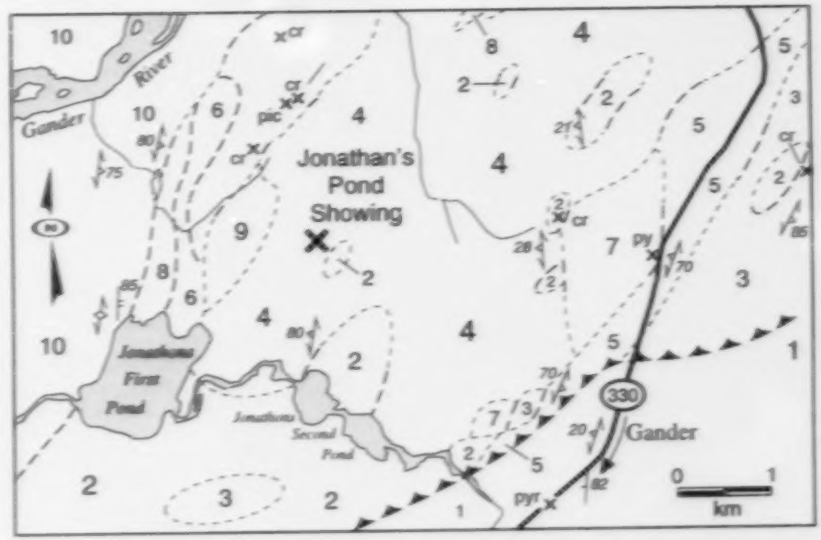


Figure 34. *General geology of the Jonathan's Pond area showing the location of the main trench (from Blackwood, 1982)*

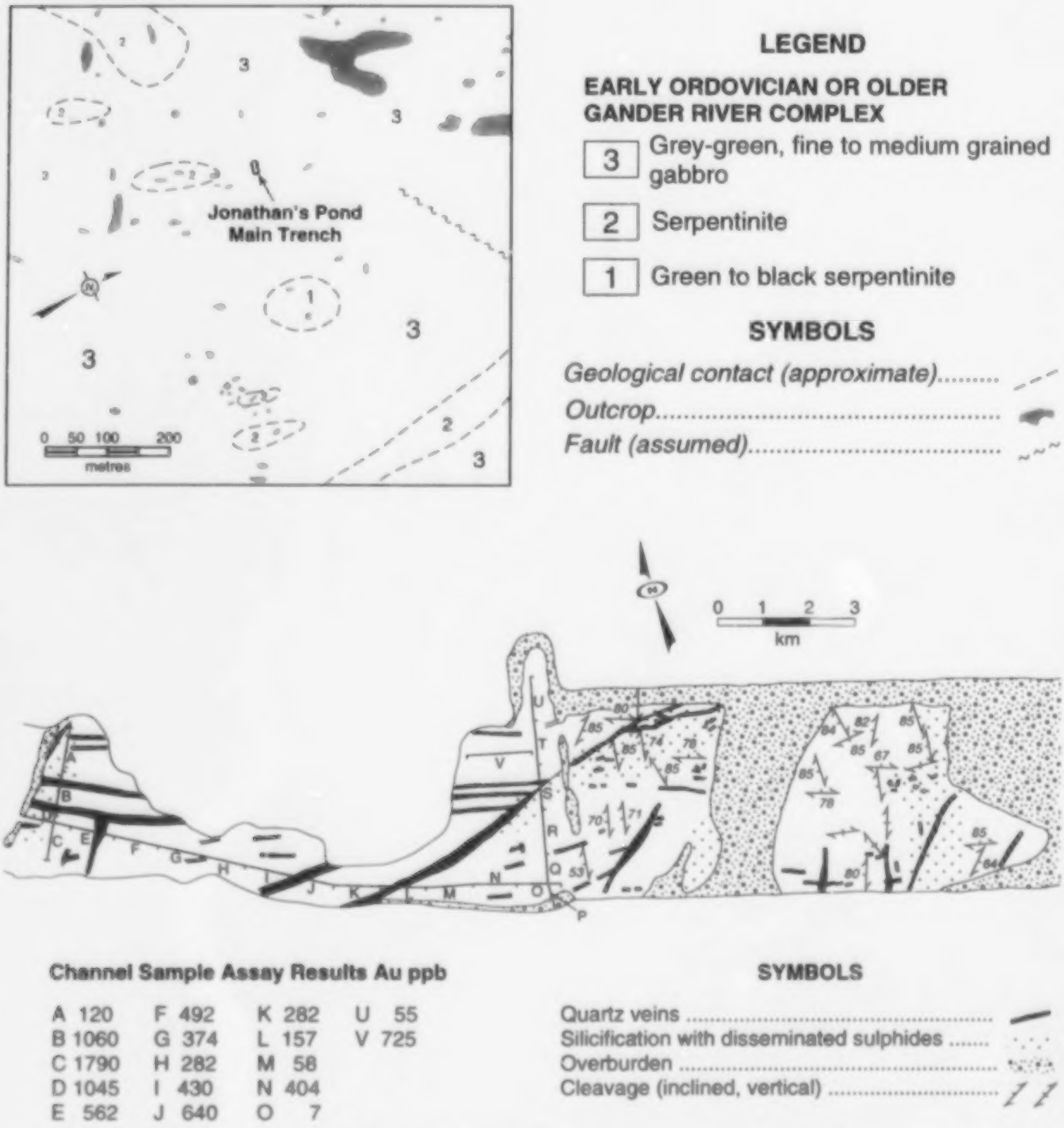


Figure 35. *Geological map (top) showing the location of the main trench, Jonathan's Pond. Geological map (bottom) of the main trench, Jonathan's Pond, illustrating channel sample locations, quartz veining and silicification developed within fine-grained gabbro–mafic volcanic rocks (from a Noranda Exploration Company Limited map produced by Peter Andrews, 1986)*

Salmon Pond, Big Pond and Ten Mile Lake define a major regional topographic linear, which may delineate the Dog Bay Line (Williams, 1993) in the NTS 2E/02 map area. If this is the case, the Big Pond area may be in part underlain by melange similar to that in the Dog Bay area and described by Williams (1993).

The altered and mineralized gabbro appears to have been intruded close to the intersection of two regionally extensive topographic linears that are interpreted to be faults (Tallman, 1989d). The gabbro has a sigmoidal shape (Figure 36), as projected from drill core, which suggests that it was rotated

Plate 38. *Arsenopyrite-bearing, extensional quartz – carbonate veins developed within altered gabbro, Jonathan's Pond prospect.*

during movement along the fault system and dilational zones formed the loci for the mineralizing fluids.

The gold is hosted by a shallowly dipping, northeast-striking, extensional quartz vein (main vein) (Plate 40) that appears to be part of a sheet-like set of quartz veins, and three of which are exposed in the trench (Figure 37). The other two veins are much narrower, more discontinuous and to date have not yielded visible gold. The main vein is exposed for approximately 8 m and exhibits pinch-and-swell structures. It has a maximum thickness of 20 cm and appears to be slightly cup-shaped, plunging to the north-northwest. The vein has a discontinuous, laminated appearance consisting of fine-grained, wispy, marginal bands of arsenopyrite and lesser pyrite, strongly altered and veined wall-rock fragments and cherty-like quartz (Plates 41 and 42). The abundant wall-rock and vein fragments indicate episodic fluid injections. The visible gold occurs as patches and coarse clusters that appear to be concentrated within the cherty quartz and along the margins of some of the fragments. Grab samples from the main vein assayed up to 441.0 g/t Au (Evans, 1992). One sample of sericitic alteration from the hanging wall of the main vein assayed 4.02 g/t Au (Tallman, 1990c).

Table 19. Bulk sample assay results from trenching, Jonathan's Pond (from Gagnon, 1981)

Trench #	Interval (m)	Au (oz/t)
1	3	0.021
1	3	0.008
2	2	0.037
2	2	0.011
3	2	0.28
4	1.5	0.045

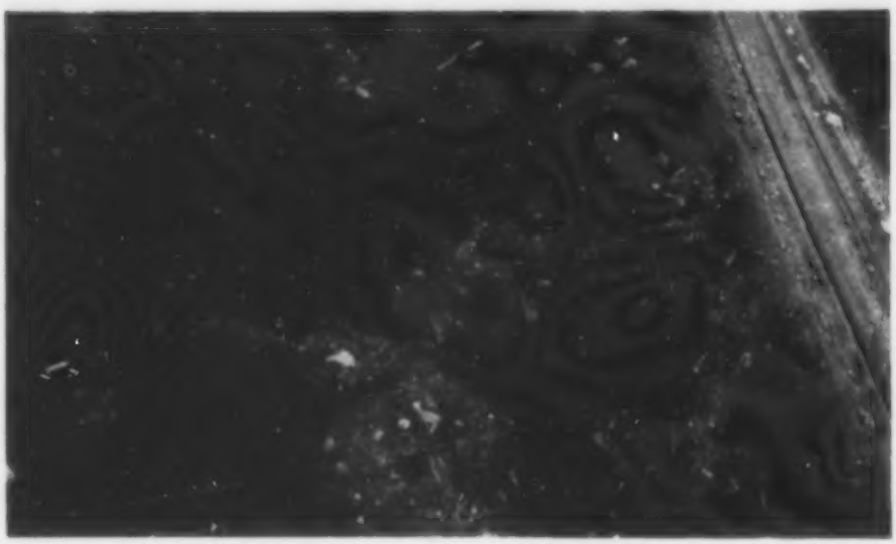


Plate 39. *Aerial view of the Big Pond prospect showing the fracture controlled Fe-carbonate alteration.*

Later, north-northwest and west-northwest-trending, small 1- to 2-cm-thick extensional quartz veins transect the north-northeast-trending veins. These veins are also reported to carry significant concentrations of gold (Tallman, 1989d). A conjugate set of narrow, brittle shears, which trend north-northwest and east-northeast, locally control quartz veining.

The diamond drilling failed to intersect the wide quartz veining observed in the trench. However, a num-

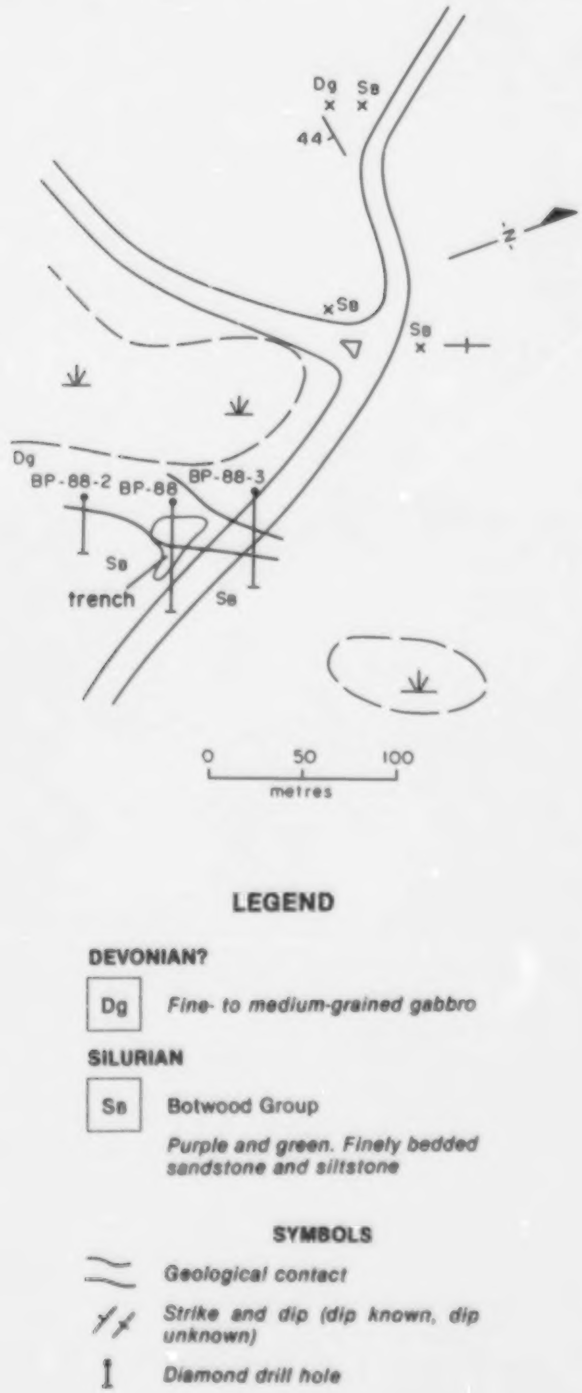


Figure 36. *Local geology of the Big Pond area (from Evans, 1991).*

ber of narrow silicified zones containing small arsenopyrite and pyrite-bearing quartz veins were intersected within the gabbro; these zones assayed up to 1.32 g/t Au over 1.8 m (Tallman, 1989d). The Big Pond prospect is classified as an arsenopyrite-rich quartz-vein style of gold occurrence.

Duder Lake Prospects

Location and Access

The Duder Lake gold prospects (Goldstash NTS 2E/07 Au002 UTM 670550 5464100; Corvette NTS 2E/07 Au004 UTM 670450 5463700) are located approximately 7 km east of Birchy Bay, Notre Dame Bay on a 9-km-long peninsula that separates Duder Lake and Rocky Pond (Figure 38). Logging roads lead into the area from Birchy Bay and Loon Bay; Stinger and Flirt (Appendix 2).

Exploration History

In 1989, Noranda Exploration Company Limited prospectors discovered gold mineralization at four localities on the Duder Lake peninsula (Green, 1989a). These occurrences include the Goldstash, Corvette and Stinger prospects and the Flirt showing. In 1989, the company conducted soil-, silt- and till-geochemical surveys, magnetic and VLF-EM surveys and excavated 9 trenches in the Duder Lake area (Green, 1989a). Eight diamond-drill holes, totalling 690 m, were drilled on the gold occurrences in the fall of 1989 (Tallman, 1990d, 1991b, Figure 39).

In 1991, a M.Sc. study to examine the setting and alteration associated with the gold occurrences was initiated by the Newfoundland Department of Mines and Energy in conjunction with Noranda Exploration Company Limited. Results of this work were presented in Churchill and Evans (1992), Churchill *et al.* (1993) and Churchill (1994).

92. Goldstash, 94. Corvette

Local Geology and Mineralization

The area is underlain by two northeast-trending units, the Ordovician Davidsville Group to the east and the Silurian Botwood Group to the west (Figure 39; Green, 1989a; Churchill and Evans, 1991). The two units are in fault contact and this fault is interpreted to be related to movement along the Dog Bay Line, a major regional structure (Williams, 1993). The Davidsville Group is characterized by a sequence of undivided grey to black slate, shale, siltstone, greywacke, and argillaceous siltstone.

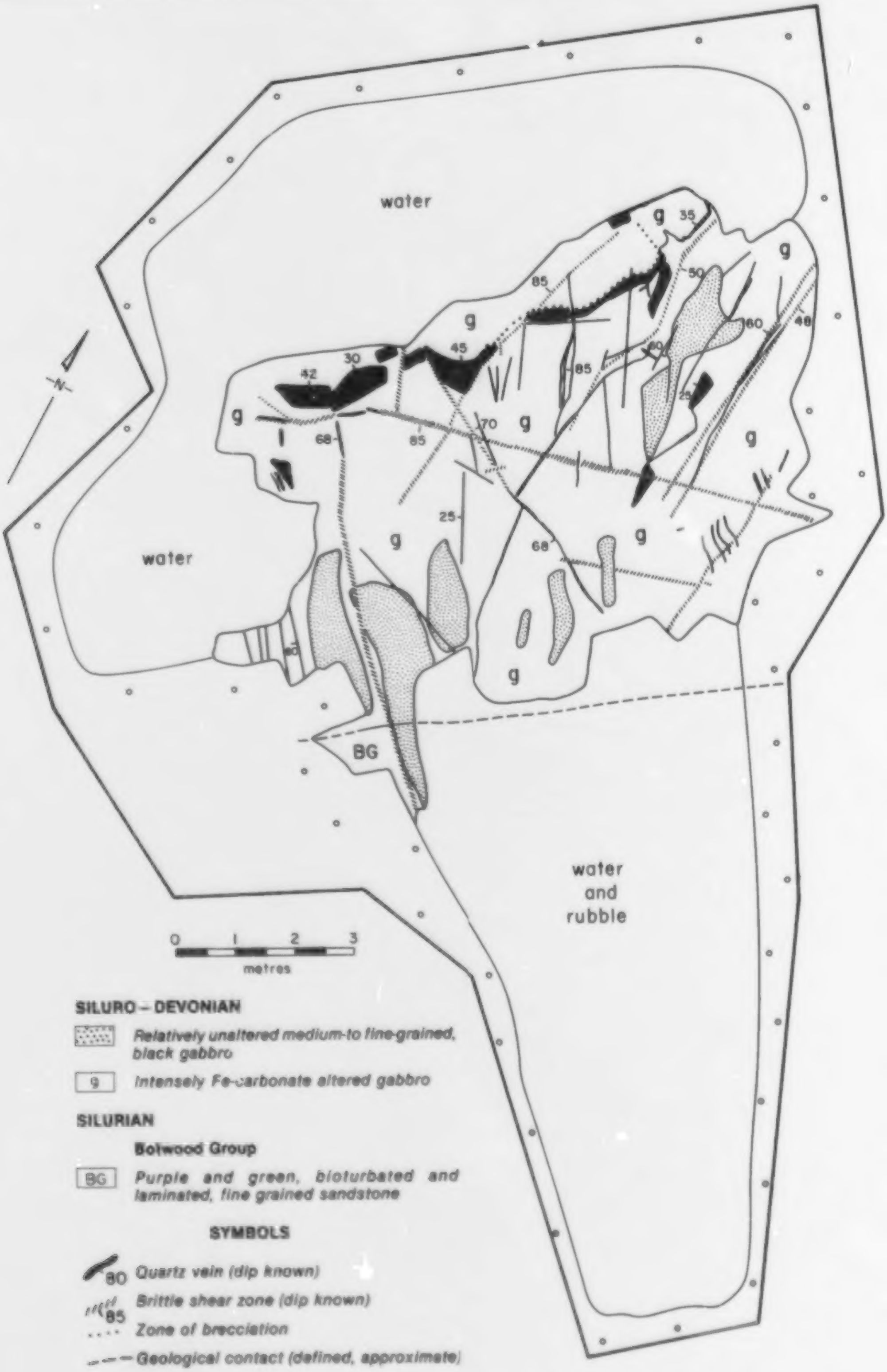


Figure 37. *Trench map, Big Pond (from Evans, 1991).*

Plate 40. *Multiple phase extensional quartz – carbonate vein, developed in Fe-carbonate altered gabbro, Big Pond.*

In the Duder Lake area, rocks of the Botwood Group consists of red, brown, grey and green micaceous siltstone, sandstone and shale (Wigwam Formation) and purple to black vesicular and amygdaloidal pillow basalts, breccias, and flows (Lawrenceton Formation); the Wigwam Formation is interpreted to be in fault contact with the Lawrenceton Formation.

The Davidsville and Botwood groups near their fault contact are intruded by numerous small, fine- to coarse-grained gabbroic to dioritic dykes and sills (Green, 1989a; Churchill and Evans, 1992). The intrusions are up to 55 m wide and 500 m long and are boudinaged and stretched parallel to the regional cleavage (Green, 1989a). The dykes and sills appear to be aligned subparallel to parallel to northeast-trending linears that transect the Duder Lake peninsula. These linears correspond in part to both magnetic lows and VLF-EM conductors (Green, 1989a). The intrusive rocks are interpreted to be Late Silurian – Early Devonian based on correlation with similar rocks in the Gander Lake area (Churchill and Evans, 1992).

Churchill *et al.* (1993) indicated that the rocks within the Duder Lake area record three deformational events. D_1 structures are preserved as overturned beds and small recumbent folds that dip steeply to the southeast. D_2, the main deformational event, is characterized by a prominent, well-developed penetrative cleavage (S_2) that is axial planar to F_2 folds. The D_3 deformational fabric consists of locally developed kinks and crenulations of the S_2 cleavage.

The low-angle, brittle – ductile Riedel shear zones that affect the gabbroic rocks are interpreted to be related to D_2 and/or D_3 deformational events and the shears are interpreted to be related to movement along the Dog Bay Line.

Gold mineralization at the Corvette and Goldstash prospects is described as shear-controlled sulphide disseminations (altered wall-rock style) restricted to the gabbroic dykes and sills. The shear zone, which hosts the Goldstash, is 0.5 to 5 m wide and has been traced by trenching for a distance of 550 m (Green, 1989a). The Corvette prospect is located approximately 800 m along strike to the southwest of the Goldstash. At this prospect, the shear is 4 m wide and has been traced by trenching over a distance of 55 m along strike (Green, 1989a).

Plate 41. *A section of the main vein, Big Pond, exhibiting multiple vein generations, altered angular wall-rock fragments and broken fine-grained arsenopyrite bands.*

The disseminated sulphide concentrations within the sheared gabbros varies

between 3 and 10 percent and consists of fine-grained pyrite and acicular arsenopyrite (Green, 1989a). The gold is interpreted to be associated with the arsenopyrite. Petrographic and SEM analyses of grab samples, which assayed in excess of 30 g/t Au, failed to find visible gold (Churchill *et al.*, 1993). The Au is believed to have replaced excess arsenic, which occupied iron-sites in the crystal lattice of the arsenopyrite. Assay results from trenching and diamond drilling are presented in Tables 20 and 21.

Alteration associated with the gold mineralization is transitional over a distance of 2 to 3 m from weakly deformed gabbro characterized by greenschist-facies mineral assemblages (uralitized clinopyroxene, albitized plagioclase, Fe-rich chlorite, leucoxene, amorphous Ti-bearing minerals, minor fine-grained epidote and calcitic veinlets) into strongly altered and sheared gabbro characterized by intense Fe-carbonatization and sulphidation (Figure 40; Churchill *et al.*, 1993). This alteration is characterized by an assemblage of sericite, penninite, arsenopyrite, pyrite, ankerite – siderite and quartz. Deformation and alteration has resulted in almost complete destruction of primary igneous minerals. Geochemical analyses indicate that the alteration is characterized by major addition of CO_2, CaO, alkalies, Au, As, Sb and minor enrichment in the LREEs (Churchill *et al.*, 1993).

Plate 42. *SEM backscatter photograph illustrating the broken bands of fine-grained arsenopyrite within the main vein, Big Pond.*

95. Clutha

Location and Access

The Clutha prospect (NTS 2E/07 Au005 UTM 674900 5475350) is located approximately 4 km south-southwest of Dog Bay Provincial Park. A forest access road originating from Route 331 leads directly to the site.

Exploration History

Gold mineralization was discovered at Clutha in 1988 by Noranda Exploration Limited prospectors. The prospect was trenched and tested by fifteen diamond-drill holes (1084.2 m in total) (Plate 43; Green, 1989a).

Local Geology and Mineralization

The Clutha area is underlain by a monotonous sequence of black shale, siltstone and greywacke (Figure 41). The shales exhibit an intensely developed north-northeast trending, steeply east-dipping, slaty cleavage. Graded bedding in the greywacke units indicates that the rocks are overturned to the northwest. These sedimentary rocks were mapped by Patrick (1956) and were included in the Silurian Indian Islands Group by Baird (1958). However, based on the presence of intercalated, fine-grained, grey-green pillow lava along strike to the northeast and lithological similarity with the Davidsville Group, suggest that the belt of sedimentary rocks, which extend northward from Second Pond along the west side of Dog Bay, may be Ordovician.

The sedimentary rocks are intruded by numerous fine to medium-grained gabbro dykes and sills(?) (Figure 41). The gabbro bodies are approximately 2 to 20 m thick and have a strike length of up to 400 m. The gabbros appear to have been intruded during early regional deformation. Crosscutting relationships between the gabbros and the sedimentary rocks are preserved locally.

Green (1989b) indicated that tight to isoclinal folding with an associated axial-planar slaty cleavage may be the dominant structural style within the area. These folds are interpreted to be steeply inclined and verge toward the northwest.

The effect of regional deformation on the gabbro bodies was inhomogeneous. In the less deformed gabbro bodies, conjugate joint patterns resulted. In other areas, where deformation was concentrated, shear fracture sets (low- and high-angle Riedel shears and central shears) formed (Figure 42). These shears played a significant role in the localization of quartz veining and alteration with the most intense alteration appearing to have been developed along the high-angle

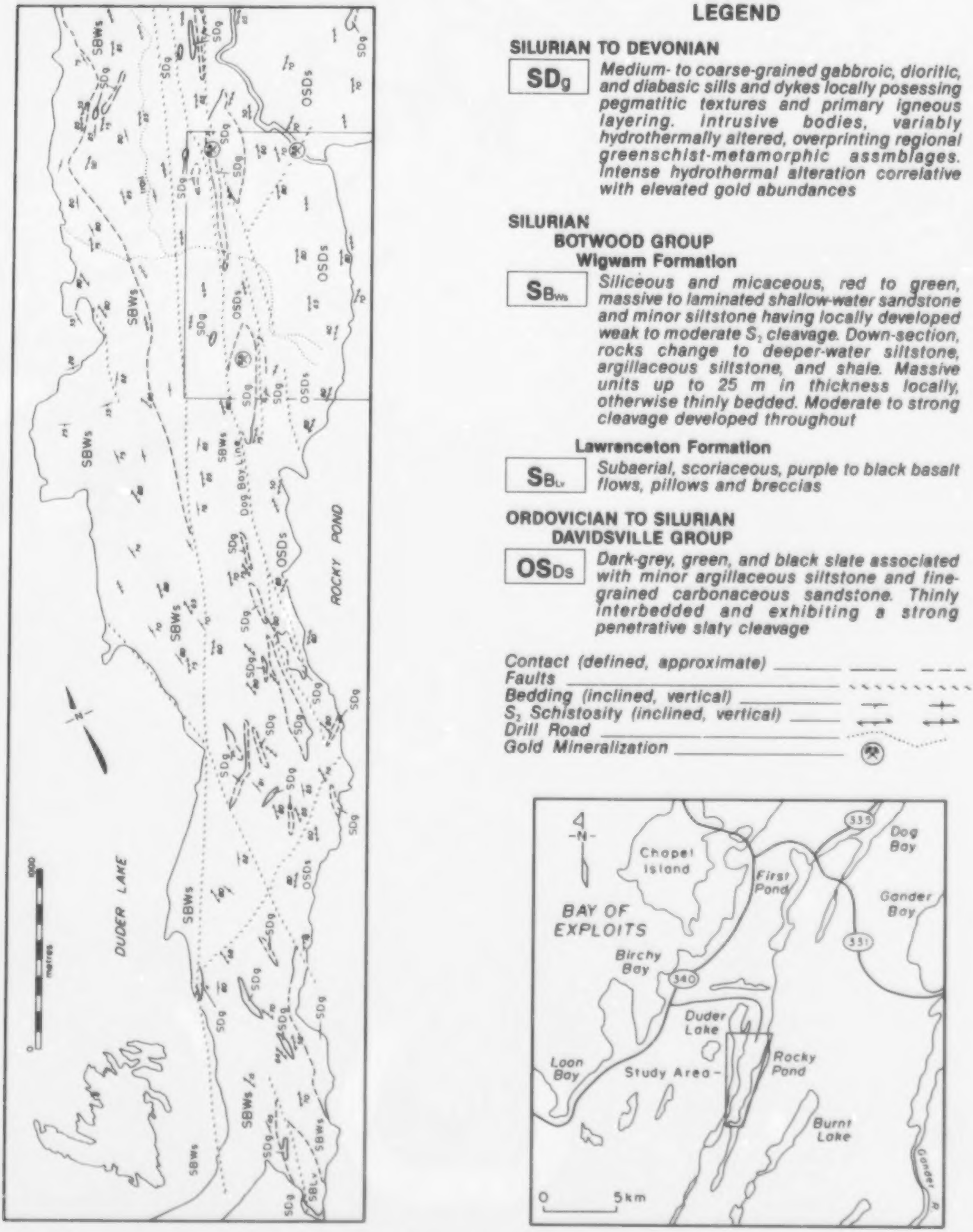


Figure 38. *Major geological units in the Duder Lake area, showing location of the gold prospects. Rectangle delineates the area shown in Figure 39 (from Churchill* et al.*, 1993).*

Table 20. Selected channel (cs) and grab (gs) sample assay results from trenches at the Goldstash and Corvette propsects (data from Green, 1989a)

Interval (m)	Au (g/t)
Goldstash	
2.6 (cs)	13.5
3.5 (cs)	3.07
1.5 (cs)	4.46
Corvette	
3.6 (cs)	2.56
(gs)	2.05
(gs)	5.6

Table 21. Selected diamond-drill core assay results, Goldstash and Corvette prospects (data from Tallman, 1990d)

Hole #	Interval (m)	Au (g/t)
Goldstash		
DL-90-01	20.7-30.5	3.86
	22.7-30.5	4.52
	27.7-30.5	7.01
DL-90-04	110.8-112.2	1.4
Corvette		
DL-90-03	31.6-32.1	1.48

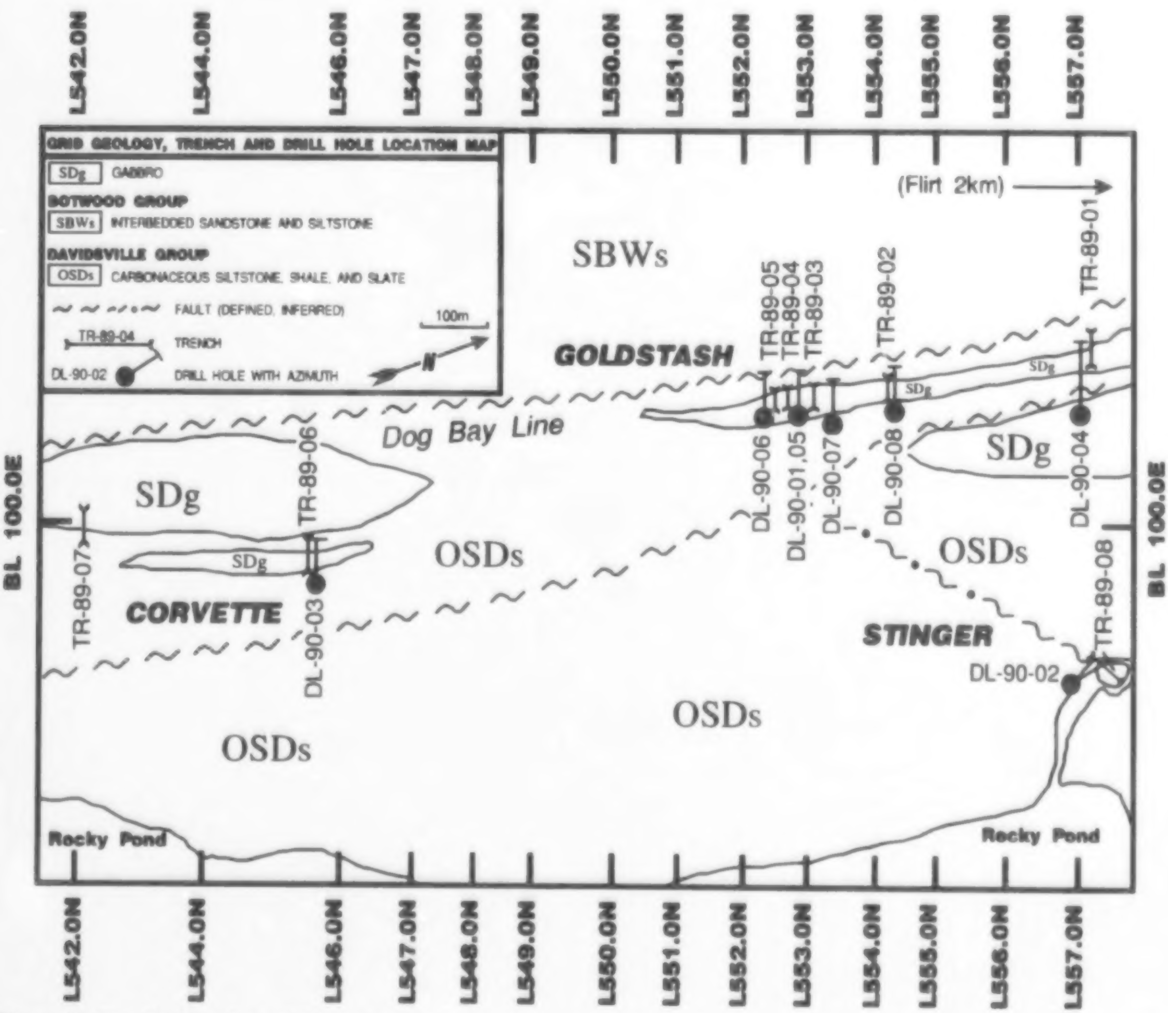


Figure 39. *Simplified geology, drill hole and trench location map for the Duder Lake gold prospects (from Churchill* et al., *1993).*

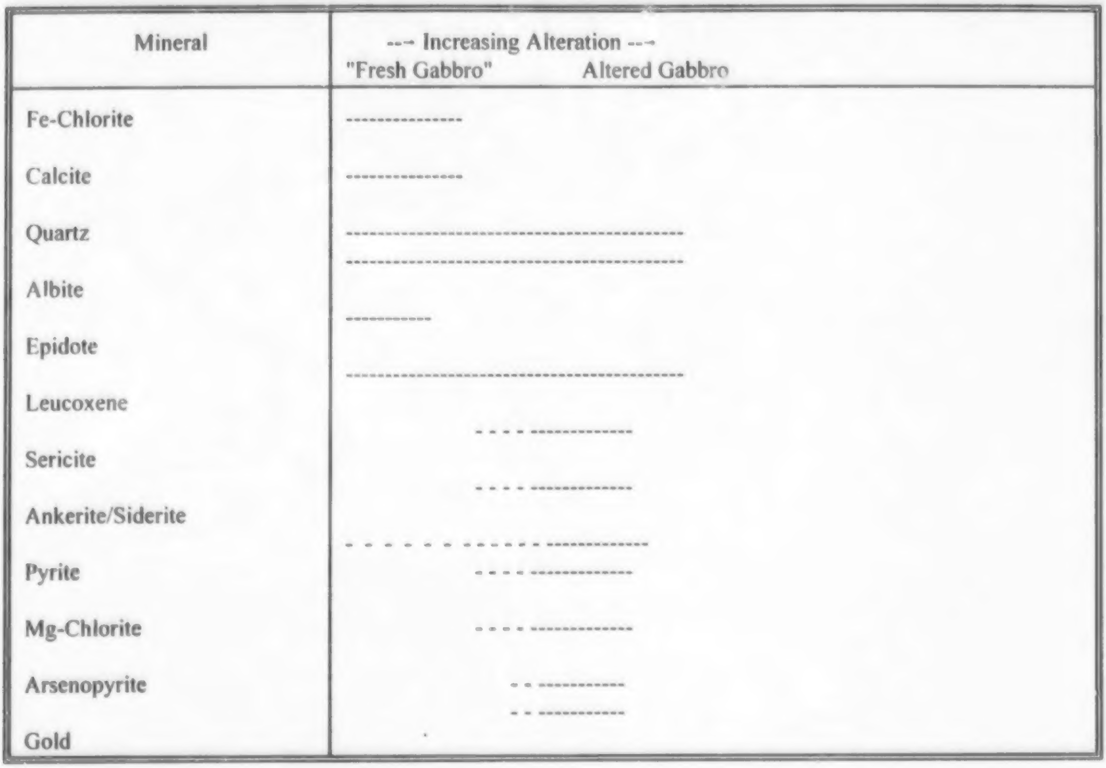


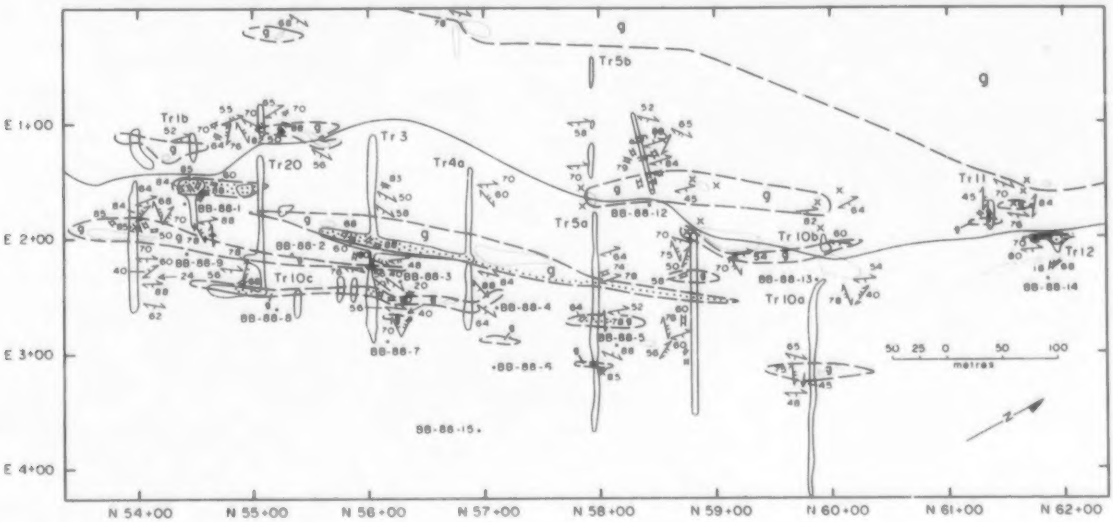
Figure 40. *Paragenesis of selected mineral phases for "fresh" and altered gabbro, Duder Lake (from Churchill* et al., *1993).*

Plate 43. *Aerial view of the Clutha prospect, view to the north-northeast. Discovery outcrop is located within the large pit next to the road. The main zone is marked by the large northeast-trending water-filled trench.*

Riedel shears (R'). Green (1989b) reported that these mineralized shears strike 45°, dip moderately to the northwest and crosscut the regional penetrative fabric at an angle of 20 to 30° (Plate 44). The zones are typically narrow, ranging from 2 to 10 m, and have a relatively limited strike potential that is governed by the width of the gabbro. The shears exhibit sinistral offset (Plate 45) and pinch out quickly within the adjacent shales. However, these shears are repeated regularly along the strike length of the gabbro forming panels of shearing and alteration which dip variably to the northeast. The economic potential of this style of mineralization is actually controlled by the strike length of the gabbro body.

Veining and alteration also locally mimicked the conjugate jointing which produced a blocky alteration pattern with remanent blocks of relatively unaltered gabbro being preserved (Plate 46). Extension-fracture veins (tension gash veins, centipede veins) occur in the less deformed gabbro adjacent to the shears (Plate 47).

The Clutha prospect is classified as an altered wall rock – quartz-vein style of gold mineralization. The gold is hosted by pyrite- and arsenopyrite-bearing quartz – carbonate shear fracture veins developed within the shears and extensional fracture veins in the gabbro marginal to the shears. The quartz veins are discontinuous and typically 2 to 10 cm, but locally up to 50 cm in thickness. Fine-grained, disseminated pyrite and arsenopyrite occur both in the veins and in silicified wall rock adjacent to the veins (Plate 48). Visible gold was observed in one quartz vein obtained from drill core (Plate 49). A channel sample from the prospect assayed 0.146 oz/t over 4 m (Noront Resources Limited, Press Release, 1990).



LEGEND

g *Fine to medium grained gabbro*

Davidsville Group: *Cleaved black shale, siltstone and minor greywacke*

Mineralized zones: *Quartz veining and Fe-carbonate alteration*

SYMBOLS

Geological contact (defined, approximate)

Dyke

Shear zone (dip known, unknown, vertical)

Quartz vein (dip known, unknown, vertical)

Bedding (overturned)

S_1 cleavage (dip known)

S_2 cleavage (dip known, vertical)

Mineral lineation (plunge known)

Axes of minor fold (sense of vergence given, plunge known)

Outcrop

Trench

Diamond-drill hole

Figure 41. *Local geology of the Clutha area showing trench and diamond-drill hole locations (from Evans, 1991).*

Plate 44. *Shear fracture quartz – carbonate vein developed within deformed gabbro, Clutha prospect. Note intense Fe-carbonate halo developed adjacent to the shear and smaller foliation parallel quartz veins.*

Assay results from trenching and diamond drilling are listed in Table 22. The Fe-carbonate-rich haloes extend up to two metres from the veins. Abundant gold can be panned where the alteration and veining have been significantly weathered.

97. Charles Cove (Tims Harbour)

Location and Access

The Charles Cove prospect (NTS 2E/08 W001 681300 5475920) is located approximately 5 km north of the community of Rodgers Cove, Gander Bay (Figure 43). A number of trails lead into the area.

Exploration History

The Charles Cove prospect was discovered by Patrick (1953) during regional geological mapping by the Geological Survey of Canada

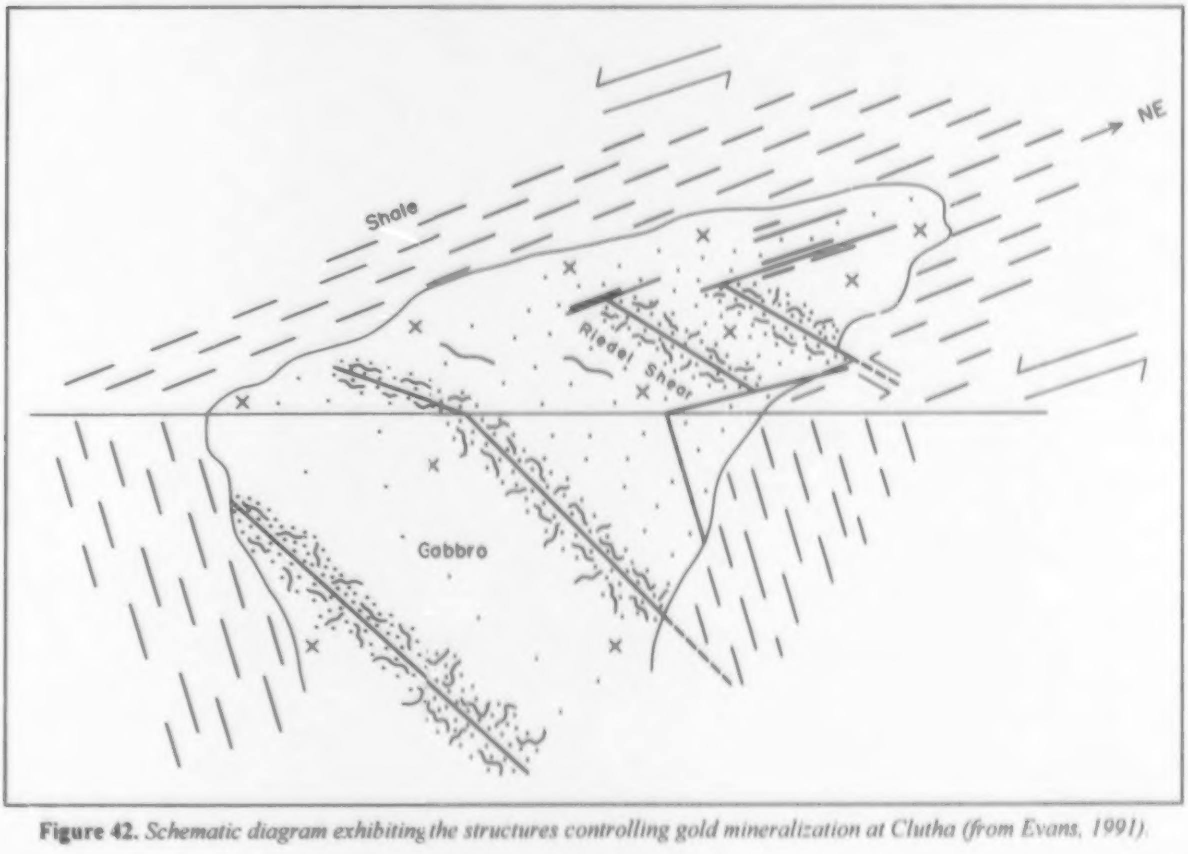


Figure 42. *Schematic diagram exhibiting the structures controlling gold mineralization at Clutha (from Evans, 1991).*

Plate 45. *Shear-fracture quartz vein developed within gabbro and green siltstone – shale, Clutha prospect. Both the vein and the shear piches out quickly within the shales. The shear exhibits a sinistral offset.*

in the Dog Bay area. The showing was prospected, trenched, mapped and a night-time fluorescence survey was conducted for tungsten by the Newfoundland and Labrador Corporation (1953 – 1954), and by Norlex Mines Limited in 1970 (O'Toole, 1967, 1970). Norlex Mines also drilled three short diamond-drill holes totalling 48.5 m with a pack-sac drill (O'Toole, 1970). Noranda prospected the area in 1989 (Green, 1989a).

Local Geology and Mineralization

The Charles Cove area is underlain by granodiorite of the Devonian Charles Cove pluton, and sedimentary rocks of the Silurian Indian Islands Group and the Ordovician Davidsville Group (Figure 43). The work by O'Toole (1967, 1970) showed that the north-north-west-striking vein, which is hosted by the granodiorite, extended for more than 1 km and varied in width from 60 cm to 4.5 m (Plate 50; Figure 43). Three generations of veining were reported: 1) white milky quartz; 2) dark-grey dirty quartz; and 3) white glassy quartz.

Wall-rock contacts are not well exposed but there appears to be little evidence for shearing within the granodiorite. Large altered wall-rock blocks and vuggy patches with well developed quartz crystals occur locally within the vein. This, together with the multiple vein generations, indicates a large extensional fracture style of quartz veining.

Mineralization within the quartz vein consists of sporadic crystals of scheelite and minor pyrite, arsenopyrite, molybdenite and chalcopyrite. The mineralization, particularly the scheelite, is reported to be associated with the dark-grey quartz and is restricted to a narrow footwall zone adjacent to the granodiorite. A grab sample from the vein assayed 2.81 percent WO_3 (O'Toole, 1967). Grab samples collected by Noranda from the mineralized portion of the vein and containing abundant pyrite, arsenopyrite and minor molybdenite and chalcopyrite assayed up to 520 ppb Au (Green, 1989a). A sample containing a 1-cm-wide band of arsenopyrite assayed 6.20 g/t Au (Green, 1989a). Patches of arsenopyrite up to 30 cm long were

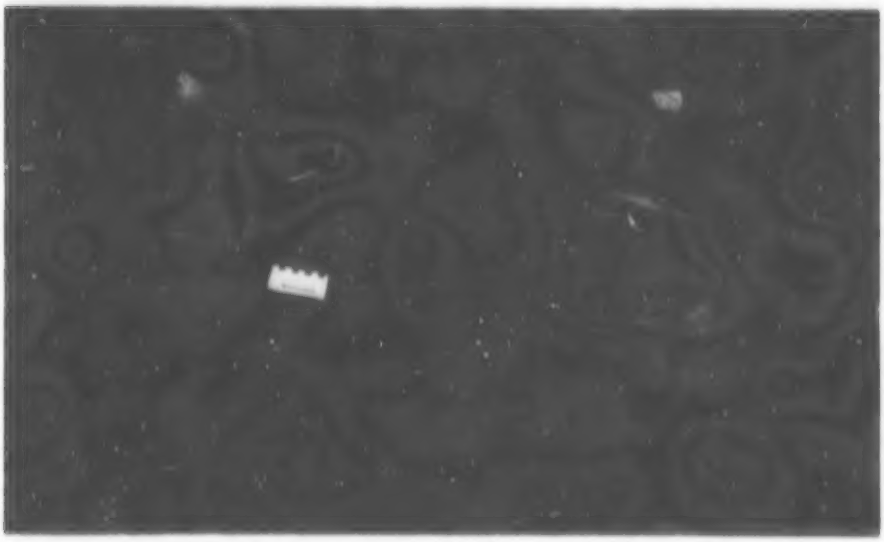


Plate 46. *Blocky alteration and quartz veining, Trench 12, Clutha prospect. Shearing, alteration and quartz veining follow jointing developed within the gabbro. Blocks are remnants of less altered gabbro.*

Plate 47. *Tension gash (centipede) veins developed within altered gabbro adjacent to the mineralized shears, Clutha prospect.*

Plate 48. *Late tension gash veins developed within silicified gabbro. Abundant fine-grained pyrite and arsenopyrite are disseminated throughout the sample, Clutha prospect.*

reported by O'Toole (1970). Assay results are presented in Table 23. Green (1989a) also reported the presence of additional quartz veins up to 3 m wide south of the original showing. These veins contain pyrite, arsenopyrite, trace molybdenite and assayed up to 2.05 g/t Au. The Charles Cove prospect is an example of a pyrite – arsenopyrite-rich quartz vein style of gold mineralization.

99. Change Islands

Location and Access

The Change Islands showing (NTS 2E/09 Au002 UTM 689750 5502425) is located on the eastern shore of the Change Island approximately 4 km southeast of the community of Change Islands. The area is best reached by boat.

Exploration History

The area was mapped by the Geological Survey of Canada (Baird, 1958) at a scale of one inch to one mile. The rocks underlying the mineralized area were assigned to the North End Formation of the Fogo Group. Williams (1967, 1972) reassigned these rocks to the Lawrenceton Formation of the Botwood Group.

Rio Algom Exploration Incorporated conducted detailed geological, geochemical and ground geophysical surveys of the area in 1984-85 (MacGillivray, 1985) and discovered a high-grade auriferous quartz vein that is exposed on a beach on the east side of Change Islands (Plate 51).

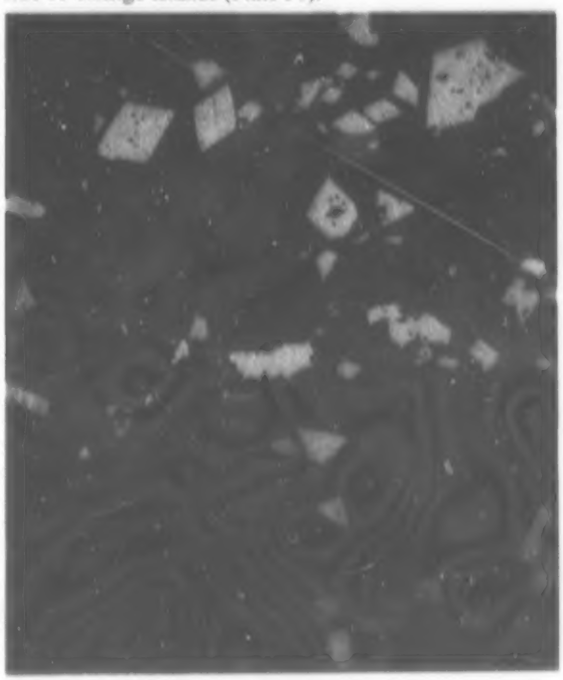


Plate 49. *SEM backscatter photograph of a quartz – carbonate vein sample, Clutha prospect. The vein contains pyrite, arsenopyrite, possibly leucoxene, and gold.*

Table 22. Selected assay results Clutha prospect. A) channel and grab samples collected from trenches; B) diamond-drill core (from Green, 1989a)

(A) Sample #	Interval (m)	Au (g/t)	Ag (g/t)	Description	Reference
Trench #	9.05	2.66	na	Altered gabbro	Green, 1989a
Trench #	4.0	3.60	na	Altered gabbro	Green, 1989a
Trench #	4.0	5.00	na	Altered gabbro	Green, 1989a
Trench #	2.5	4.5	na	Altered gabbro	Green, 1989a
DE-90-33e	Grab sample Trench 12	1.2	<2	Quartz vein with altered wall-rock	Evans, 1992
DE-90-50e	Grab sample Trench 18	5.76	<2	Quartz vein	Evans, 1992

(na, not analyzed)

(B) Hole #	Interval (m)	Au (g/t)
BB-88-01	14.1-14.35	1.45
BB-88-03	12.2-14.9	1.20
BB-88-06	28.9-30.8	5.2
	28.9-29.9	9.45
	51.6-53.6	1.11
BB-88-07	20.4-21.9	1.25
BB-88-08	44.6-45.1	1.45
BB-88-09	50.6-54.4	1.28
	51.1-52.9	1.8
BB-88-11	4.6-5.1	1.26
BB-88-13	13.8-14.3	1.86
BB-88-15	92.5-92.9	1.43

Plate 50. *Large extensional quartz vein, developed within granodiorite, Charles Cove. The vein is laminated, locally vuggy and contains small patches of arsenopyrite that have assayed up to 6.02 g/t Au.*

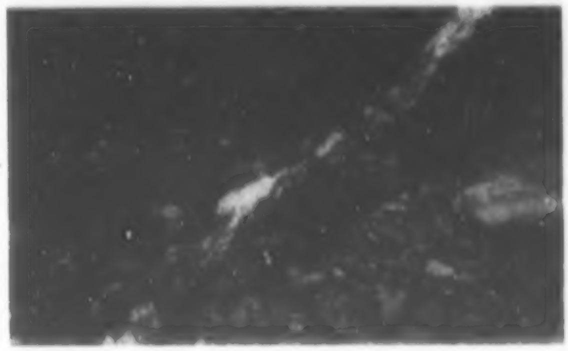


Plate 51. *Extensional, weakly laminated, base-metal-rich quartz vein developed within a felsic dyke, Change Islands.*

Local Geology and Mineralization

The mineralized quartz vein is hosted by a siliceous, feldspar-porphyry dyke that has intruded felsic pyroclastic and green tuffaceous rocks. The dyke is 2 to 5 m wide, trends 188°/78E° and contains minor sulphides and the contacts with the felsic volcanic rocks are sharp but are locally fractured and rusty.

The quartz vein is milky-white, weakly laminated and locally vuggy. It trends 165°/65°W, is approximately 30 cm wide, and is exposed continuously for approximately 5 m

Table 23. Grab sample assay results from the Charles Cove prospect

Sample #	Au (ppb)	Ag (ppm)	Sb (ppm)	As (%)	WO_3 (%)	Rock Description	Reference
Grab	na	na	na	na	2.81	Quartz vein	O'Toole (1967)
Channel (30 cm)	na	na	na	na	1.02	Quartz vein	O'Toole (1970)
Grab	520	na	na	na	na	Quartz – asp. vein	Green (1989a)
Grab	6200	na	na	na	na	Quartz – asp. vein	Green (1989a)
Grab	2050	na	na	na	na	Quartz vein located to the south	Green (1989a)
DE-90-181	89	130	34.2	0.78	na	Quartz – asp. vein	Evans (1992)
DE-90-182	200	40	33.6	1.78	na	Quartz – asp. vein	Evans (1992)

(asp, arsenopyrite; na, not analyzed)

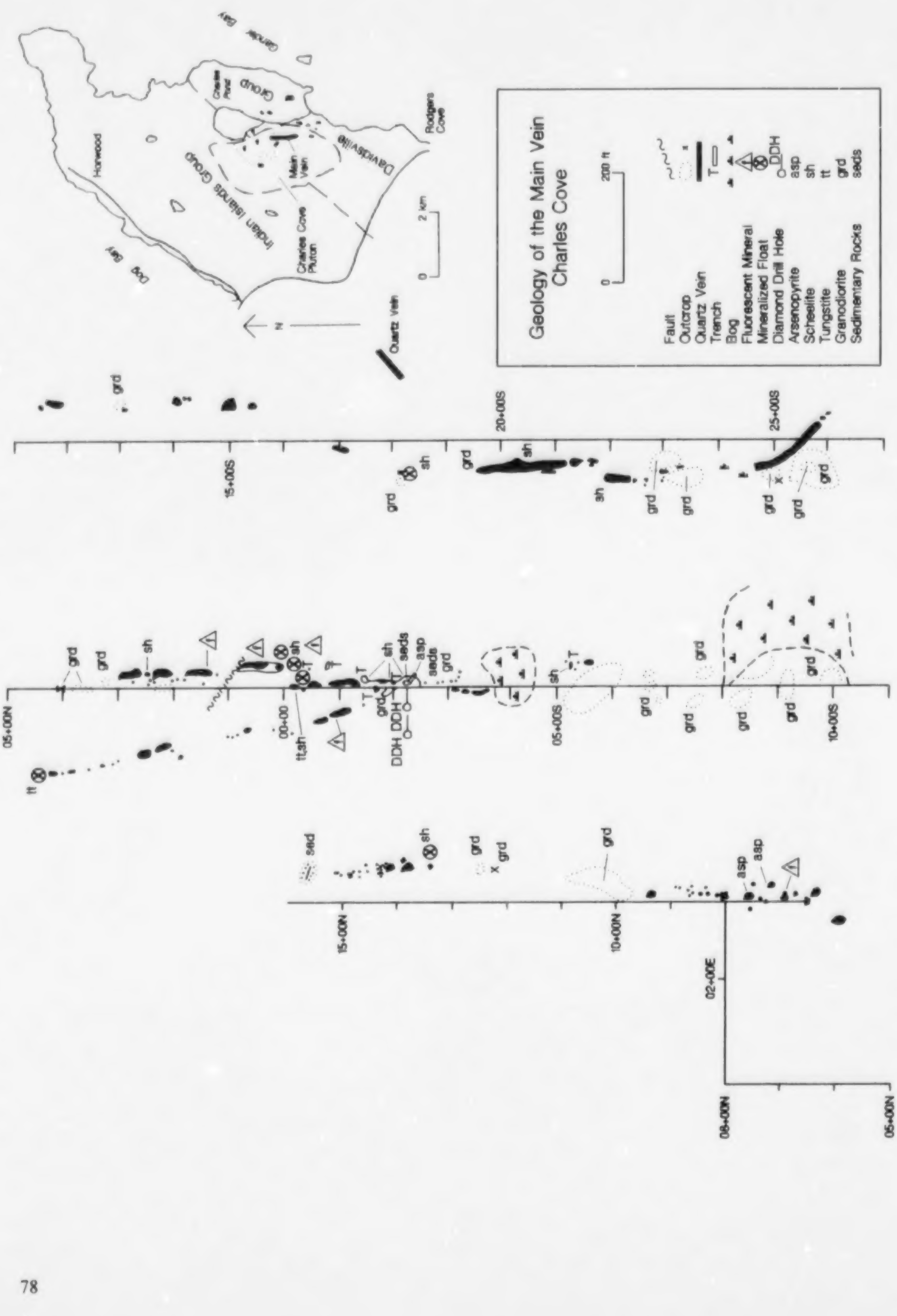


Figure 43. *Local geology of the Charles Cove prospect (from O'Toole, 1970). Regional geological map modified from Dean (1978b) and Currie* et al. *(1980).*

Plate 52. *Close-up of the base-metal-rich quartz vein, Change Islands showing. The vein contains patches, veinlets and stringers of chalcopyrite, sphalerite, galena and pyrite.*

along strike. The vein was traced to the northwest by trenching for approximately 10 to 12 m (MacGillivray, 1985). Wall-rock margins are slightly sheared and locally brecciated.

The vein contains fine disseminations, patches and stringers of galena, sphalerite, chalcopyrite and pyrite (Plate 52). A grab sample of the vein assayed 23.2 g/t Au, 0.5 percent Cu, 3.8 percent Pb, 1.1 percent Zn and 20.9 g/t Ag (Evans, 1993a). Grab samples collected by Rio Algom Exploration Incorporated assayed between 1.52 to 164.1 g/t Au and between 43 to 121 g/t Ag (MacGillivray, 1985). The showing is classified as a base-metal sulphide style of gold mineralization.

A number of weakly mineralized (galena and chalcopyrite), non-auriferous quartz veins and zones of sheared and rusty volcanic rocks (with < 1 percent pyrite and pyrrhotite) were also reported from the area by Rio Algom Exploration Incorporated (MacGillivray, 1985).

DISCUSSION

The epigenetic gold occurrences described in the previous section and in Appendix 2 illustrate the diversity of gold mineralization in central Newfoundland. The following section outlines in detail a classification scheme developed for this potentially significant group of occurrences. Aspects affecting the regional setting, mineralizing fluid sources, depth of formation and age constraints are also discussed.

GOLD DEPOSIT CLASSIFICATION

Classification schemes have been proposed for gold deposits elsewhere in the Canadian Appalachians; i.e., in western Newfoundland (Dubé, 1990) and New Brunswick (Ruitenberg *et al.*, 1990). Dubé (*op. cit.*) developed a two-fold classification scheme for gold-only deposits in western Newfoundland. This scheme, based on deposit morphology, consists of disseminated stratabound sulphide gold (DSSG) and mesothermal veins. The DSSG-type is defined as stratabound, unrelated to quartz veining and contains abundant disseminated sulphides with which the gold is associated. It can be subdivided on the basis of host rock into: 1) DSSG in silicified rock, e.g., Hope Brook deposit; and 2) DSSG in sedimentary rocks, e.g., Nugget Pond deposit.

The mesothermal vein type of gold-only deposit is subdivided into quartz-vein type and altered wall-rock type, both of which are spatially associated with major fault systems (Dubé, 1990). The quartz-vein type comprise extensional veins, shear fracture veins and quartz-breccia stockwork. The veins commonly contain sulphides and locally carbonate and feldspar. Wall-rock alteration is described as variable, but is generally weak and consists of chlorite, carbonate, minor sericite, pyrite and green mica. The Cape Ray deposit in southwest Newfoundland, the Dorset showing and the Pine Cove deposit on the Baie Verte Peninsula and the Rendell – Jackman deposits near Springdale are examples of the quartz-vein type of gold occurrence.

The altered wall-rock type comprises disseminated gold – sulphides in strongly altered rock adjacent to quartz veining. The Stog'er Tight deposit on the Baie Verte Peninsula is an example of this style of mineralization. The mesothermal-vein type gold deposits are the most common style of gold mineralization in Newfoundland (Dubé, 1990).

For epigenetic gold deposits in New Brunswick, Ruitenberg *et al.* (1990) proposed a five-fold classification scheme: 1) quartz – carbonate veins and stockwork; 2) polymetallic

veins; 3) contact metasomatic; 4) porphyry copper; and 5) volcanic breccia deposits (epithermal). These styles of mineralization are concentrated in major fault zones proximal to major tectonstratigraphic boundaries. The quartz – carbonate veins contain pyrite, arsenopyrite, locally stibnite and minor silver minerals, sphalerite, chalcopyrite, galena and scheelite. The veins comprise both shear- and extension fracture-style veins developed within fault zones. The polymetallic veins typically contain coarse-grained sulphides and have broad sulphide haloes.

The epithermal-style deposits are associated with subvolcanic intrusions and are characterized by intense hydrothermal breccia, crustiform banding, open space-filling textures and multistage veining (Ruitenberg *et al.*, 1990). Argillic alteration, silicification, purple fluorite, iron and manganese oxides, elevated levels of antimony, silver, arsenic, base metals and mercury are associated with these deposits.

Within the eastern Dunnage Zone, gold occurs both as syngenetic deposits associated with volcanogenic processes and as epigenetic deposits that are generally structurally controlled. This study centred on the newly emerging class of epigenetic gold mineralization. It was recognized early in this project (Evans, 1991) that epigenetic occurrences actually comprised both mesothermal and epithermal styles of gold mineralization.

Auriferous mesothermal systems are typically associated with deep-seated, regionally extensive shear zones that provide conduits for the mineralizing fluids. Mesothermal gold deposits within Archean and Phanerozoic rocks have been extensively studied and the reader is referred to the work of, and compilations by, Colvine *et al.* (1984, 1988); Groves *et al.* (1988); Bursnall (1989); Colvine (1989); Hodgson (1989); Kerrich (1989a and b); Barley and Groves (1990); and Kerrich and Feng (1992). Although they vary considerably with respect to host rock and gangue mineralogy, many mesothermal gold deposits share a number of common characteristics including an alteration assemblage dominated by Fe-carbonate – sericite – pyrite, and a spatial association with major shear zones, commonly terrane-bounding structures, which provide potential conduits for deep crustal fluids. The fundamental characteristics of mesothermal gold systems are reviewed in Table 24.

The majority of Newfoundland mesothermal gold occurrences are spatially associated with large brittle – ductile fault systems (Dubé, 1990; Evans, 1991, 1993). Such fault systems or shear zones exhibit complex deformation histories with both brittle and ductile styles of deformation. Typically, such zones are comprised of schistose or mylonitic rock across which there has been both continuous and discontinuous offset of external markers (Hodgson, 1989). Brittle – ductile deformation is thought to occur within a temperature range of 250 to 300°C and at depths of 10 to 15 km in a zone transitional between brittle and ductile behaviour (Sibson, 1977, 1989)

Evans (1993) developed a classification scheme that subdivided mesothermal gold mineralization into three classes: 1) auriferous quartz veins; 2) altered wall rock ± quartz veins; and 3) disseminated gold (Figure 44). The class of mineralization is dependent upon host-rock characteristics, rheological properties and permeability, and a great degree of overlap may exist between the classes, particularly in the altered wall-rock class. The altered wall-rock class is adapted from the classification scheme of Dubé (1990).

Auriferous Quartz Veins

In response to brittle – ductile deformation, a sequential system of fractures and small-scale shears can develop within brittle – ductile shear zones. These include extensional fractures (tension gashes and "Centipede veins") and shear fractures, controlled by low-angle (R) and high-angle (R') Riedel shears, pressure shears (P), and central (C) shears (Hodgson, 1989), also called D shears (Roberts, 1988; Figure 45). The development of the various types of shears and fractures is synchronous with progressive deformation. This can result in a complex system of vein overprinting. Shear fracture veins typically form the best exploration targets because they are larger and more economically significant than the extension fracture veins (Roberts, 1988).

For more detailed information the reader is referred to comprehensive reviews on shear zone terminology by Bursnall (1989) and Hanmer and Passchier (1991), and on shear-related vein systems by Roberts (1988) and Hodgson (1989).

The characteristics of the auriferous quartz-vein style of mineralization from the eastern Dunnage Zone are presented in Table 25. These auriferous quartz veins are further subdivided into five subclasses based on gangue mineral content (Figure 44): 1) pyrite-rich, 2) pyrite – arsenopyrite-rich, 3) base-metal sulphide-rich, 4) barite-rich, and 5) antimony-rich (Evans, 1993a).

Pyrite-Rich Quartz Veins

Auriferous quartz veins, which contain significant concentrations of pyrite and only trace amounts of arsenopyrite and base-metal sulphides, are classified as pyrite-rich quartz veins. The veins contain pyrite (with which the gold is often associated) and locally tourmaline, sericite, paragonite, minor base metals, traces of scheelite, tungstite, pyrrhotite, arsenopyrite, bornite and free gold. This vein subclass is not restricted to a particular rock type, but, it is best developed in

Table 24. Summary of the major characteristics of Archean lode gold mineralization

MESOTHERMAL VEINS

SETTING

- spatially related to major structural breaks formed, in part, by tectonic shortening
- localized along 2nd order or higher structures where brittle – ductile deformation predominates
- irregular distribution of Au deposits along these structures indicating focused fluid flow due to local extensional features
- shear zone must exhibit little displacement, be active and permeable for an extended period and open to a large volume of fluids
- late syn- to post-regional metamorphism

HOST ROCKS

- mineralization occurs in all rock types; mafic rocks (i.e., Fe-rich) favoured
- some are spatially associated with felsic intrusive rocks

VEIN GEOMETRY

- simple shear strain predominates resulting in
  (1) shear fracture veins within R (low-angle Riedel shears), R'(high-angle Riedel shears), P (pressure shears), D (central shears) shears
  (2) extensional fractures, T (tensional) veins
- geometry of veins controlled by shear zone orientation and style, and by host lithology orientation and rheological properties
- 1 to 10s of metres wide with strike lengths of 10s to 100s of metres
- part of larger anastomosing structure (kms long and up to 2 km in depth) with individual shears hosting a vein system
- vein formation and deformation synchronous
- overall vertical extent of mineralizing system may be on the order of 10 to 15 km in depth

VEIN CHARACTERISTICS

- coarse, milky-white to grey quartz, often cherty-like
- laminated indicating multiple fluid injections
- gangue minerals (albite, Fe-carbonate, tourmaline, sericite, chlorite, pyrite, pyrrhotite, arsenopyrite, galena, sphalerite, chalcopyrite, molybdenite, stibnite, tellurides and tungsten)
- CO_2-rich, low salinity fluid inclusions.
- hydrothermal fluid temperatures between 250 and 400°C

ALTERATION

- an extensive outer chlorite – calcite zone, often linear due to shear zone control
- inner carbonate zone comprised of Fe-dolomite, sericite, pyrite and quartz
- forms haloes 1 to 10s of metres around vein systems, often overlap and merge to produce a broad zone
- intensity of Fe-carbonate alteration depends on the availability of Fe in the host rock

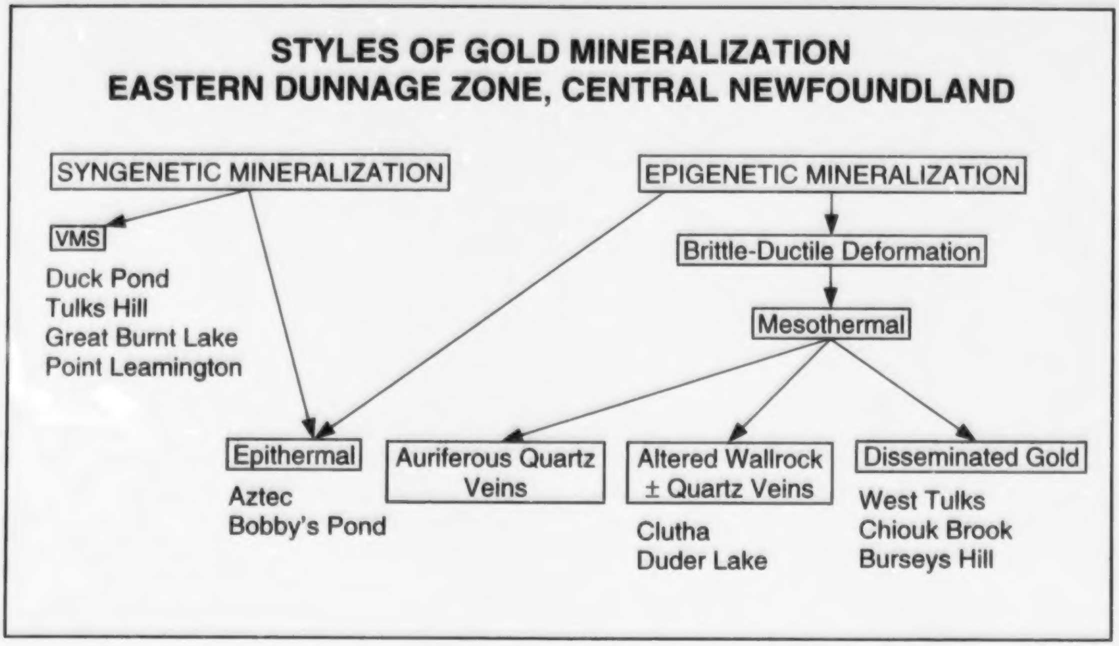
areas dominated by felsic volcanic sequences, e.g., the Victoria Lake area prospects at Midas Pond and Valentine Lake.

Pyrite – Arsenopyrite-Rich Quartz Veins

Pyrite – arsenopyrite-rich quartz veins constitute the most common and widely developed subclass of auriferous veins. These veins predominate in areas where the regional geology has a significant sedimentary rock component, such as the Bay d'Espoir, Great Bend – Paul's Pond and Glenwood – Notre Dame Bay areas. Within the Victoria Lake area, arsenopyrite-rich quartz veins are restricted to sedimentary sequences peripheral to the felsic volcanic rocks.

Base-Metal-Rich Quartz Veins

Base-metal sulphide-rich veins are typically small, less than 5 cm thick and discontinuous. These veins are dominantly extensional and exhibit comb structures, open space-



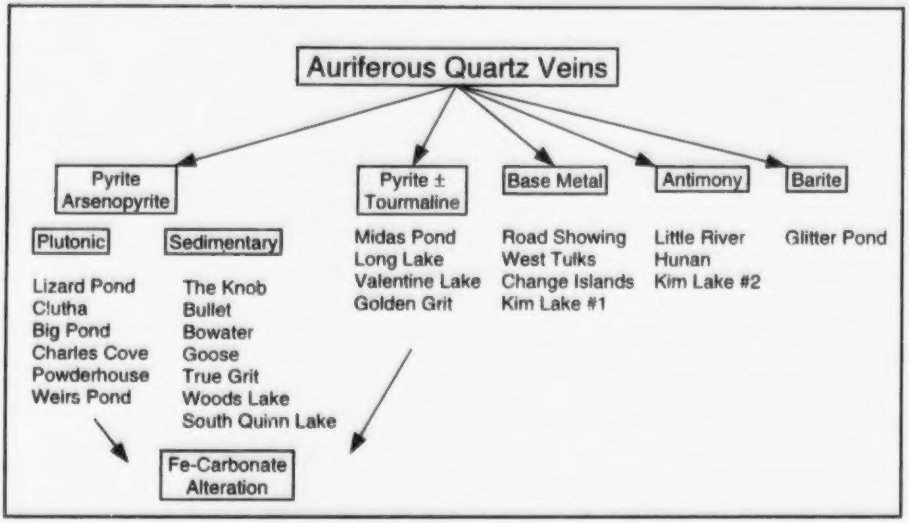


Figure 44. *Classification scheme for gold mineralization within the eastern and central Dunnage Zone. Included are possible alteration zones and antimony mineralization that may or may not contain anomalous gold (from Evans, 1993a).*

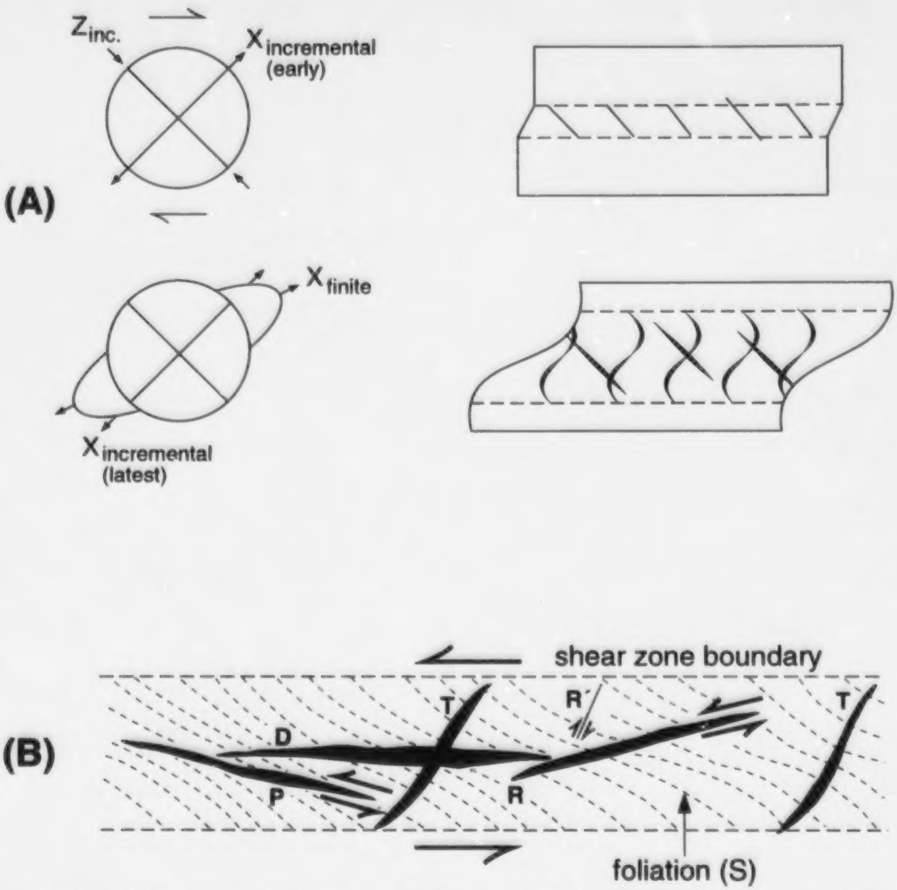


Figure 45. *A) The progressive development of en echelon extension fractures within a brittle – ductile shear zone. B) The orientation of extension fractures (T) and shear fractures (R, R', P and D) which develop during brittle – ductile deformation. R, low-angle Riedel shears; R', high-angle Riedel shear; P, pressure shears, and D, central shears (from Roberts, 1988).*

filling textures and little evidence of shearing along vein margins. Silver contents can be quite variable, ranging from nil to greater than 100 g/t for mineralized float from Pats Pond (Thurlow and Barbour, 1982), and appear to be directly related to the relative abundance of galena. This style of mineralization is not geographically restricted, but it does appear to favour intrusive and volcanic rocks.

Antimony-Rich Quartz Veins

Antimony-rich quartz veins represent an extensive style of mineralization that appears to be restricted to the eastern margin of the Dunnage Zone. They do not appear to constitute a significant style of mineralization within the Victoria Lake area. A brief review of antimony mineralization associated with the Hercynian of western Europe (France and the Iberian Peninsula), the Caledonian of Ireland, the Canadian Cordillera and the Canadian Appalachians is presented below as an attempt to define characteristics applicable to Newfoundland examples.

The Hercynian orogenic belt of western Europe is host to numerous antimony and antimony – gold deposits (Mossman *et al.*, 1991). Significant deposits of antimony have been exploited on the Iberian Peninsula (Gumiel and Arribas, 1987) and within France (Bril and Beaufort, 1989). Gumiel and Arribas (1987) described three classes of antimony deposits within the Iberian Hercynian massif: 1) stratabound Sb – W – Hg deposits associated with calcareous, sandy or siliceous rocks and possibly related to pre-orogenic volcanism; 2) vein-type deposits and 3) Sb deposits within post-orogenic volcanic dykes, typically rhyodacitic. Both the stratabound and vein-type deposits are described as having strong structural control.

Eight mineralogical associations were described from these antimony deposits, the most significant being quartz – stibnite and quartz – stibnite – gold veins (Gumiel and Arribas, 1987). The quartz – stibnite – gold veins typically have significant concentrations of arsenopyrite and pyrite with which the gold is associated. The arsenopyrite – gold-bearing veins are interpreted to have originated at deeper levels than the quartz – stibnite veins. The richest Sb – Au deposits occur along the deeply fractured northwestern edge of the Hercynian Belt (Gumiel and Arribas, 1987; Mossman *et al.*, 1991).

The Iberian antimony deposits are interpreted to be related to either volcanogenic processes or to the emplacement of intrusive rocks (Gumiel and Arribas, 1987). There is a spatial association between many of the deposits and granitic rocks. The granitic intrusions either produced antimony-rich fluids or remobilized older stratabound antimony mineralization. The deposits are described as mesothermal-style mineralization transitional between

Table 25. Characteristics of the auriferous quartz-vein class of mesothermal gold mineralization from central Newfoundland

Class 1: Auriferous Quartz Veins	
Host Rock	serpentinite, gabbro, diorite, granite, felsic dykes, felsic and mafic volcanic rocks, greywacke, sandstone and shale
Wall-rock Alteration	*ultramafic rocks* - silica and hematite (e.g., Lizard Pond and Breccia Pond)
	mafic rocks - strong Fe-carbonate, disseminated pyrite and arsenopyrite, and silica and chlorite (e.g., Big Pond)
	felsic rocks - sericite, silica, pyrophyllite and kaolinite (e.g., Midas Road, Charles Cove, and Change Islands)
	sedimentary rocks - weak to moderate silicification, disseminated pyrite and arsenopyrite (e.g., the Knob, Bullet and the Bowater)
Vein Style	shear hosted and extensional vein styles width 1 cm to 2 m strike length from < 1 m to almost 1 km exhibit pinch-and-swell textures, banding, angular wall-rock fragments, open-space filling textures (comb textures and vugs), milky white quartz with abundant CO_2-rich fluid inclusions
Gangue Minerals	carbonate, sericite, chlorite, pyrite, arsenopyrite, stibnite, boulangerite, scheelite, tungstite, barite, hematite, tetrahedrite, sphalerite, chalcopyrite, galena and tourmaline
Size	variable
	Powderhouse Cove – 2 cm wide, up to 15 cm long
	Big Pond – 20 cm wide, exposed strike length 8 m
	Charles Cove – up to 2 m wide, strike length in excess of 1.2 km
	The Knob – up to 50 cm wide, strike length in excess of 75 m
Gold	-elemental, rarely as electrum or telluride -typically as inclusions in pyrite and arsenopyrite -locally as free gold in quartz veins

intrusive (magmatic) types and subvolcanic (epithermal) deposits.

Within the Massif Central area of France, Bril and Beaufort (1989) related antimony deposits to late Hercynian magmatism, with the deposits exhibiting a zonal distribution centered on intrusive rocks. High-temperature veins (W – As – Au) were interpreted to occur in restricted zones marginal to granitic intrusions. Lower temperature veins (As – Sb – Au) occur in more distal zones up to 20 km from the expected heat source.

The lower Paleozoic greywacke of the Longford – Down inlier, Ireland, is host to Sb – As – Au vein mineralization at the Lisglassan – Tullybuck deposit (Morris *et al.*, 1986). The mineralization is localized within a northwest – northeast-trending system of faults and is interpreted to postdate the regional Caledonian metamorphism. Two principal mineralizing episodes have been identified: these are 1) arsenopyrite – pyrite within lodes and as disseminations in altered wall rock, and 2) a subsequent antimony mineralizing event. Both are crosscut by minor carbonate, sphalerite, chalcopyrite and galena veinlets. Gold occurs mainly within the arsenopyrite and to a lesser degree within pyrite and as minute grains. The mineralization is interpreted to be related to Caledonian igneous activity (Morris *et al.*, 1986).

Antimony deposits within the Canadian Appalachians are typically not of the European Hercynian stratabound quartz – Sb – W, quartz – Sb – Hg or Sb – W – Hg style of deposit

(Mossman *et al.*, 1991). The West Gore Mine, Nova Scotia and the Lake George Mine, New Brunswick, are among the most significant antimony deposits within the Canadian Appalachians. The West Gore Mine produced stibnite and native antimony at the turn of the century. The ore was recovered from quartz veins developed within the Halifax Formation of the Meguma Group (Graves, 1992). Approximately 218 kg of gold was recovered as part of the operation (Mossman *et al.*, 1991). The gold is believed to be localized where the antimony-bearing veins intersect bedding parallel quartz veins (Graves, 1992). The former Lake George Mine is located within the contact aureole of a Devonian granodiorite stock, which has intruded Silurian greywacke and slate of the Fredericton Cover Sequence (Ruitenberg *et al.*, 1990). The antimony-bearing quartz veins crosscut a gold-bearing skarn deposit related to the intrusion of the granodiorite.

Within the Canadian Cordillera, there is a spatial association between mesothermal gold, stibnite and mercury deposits and strike-slip faults (Nesbit *et al.*, 1989). Nesbit *et al.* (*op. cit.*) proposed a model for these deposits based on stable isotope characteristics for each deposit style. This model involved the convection of meteoric waters to depths of 12 to 15 km and temperatures of 300 to 400°C. These fluids then ascend along permeable zones associated with extensive strike-slip faults, and quartz – pyrite – arsenopyrite – gold veins form at depths of approximately 10 km and temperatures in the range of 300° ± 50°C. At shallower levels and lower temperatures antimony-quartz (± gold) veins are deposited. At surface, mercury deposits form at temperatures of approximately 150°C.

In general, antimony deposits can be: 1) stratabound, related to possible pre-orogenic volcanism, 2) vein type (± gold), and 3) associated with post-orogenic felsic dykes. Vein mineralogy (quartz – antimony or quartz – antimony – gold) appears to dependent on depth and temperature of formation. Gold is typically associated with arsenopyrite – pyrite and is deposited at deeper levels and higher temperatures. Antimony – quartz veins are interpreted to form at shallower depths and lower temperatures. There is also an apparent spatial association between granitic intrusive rocks and antimony deposits.

In the eastern Dunnage Zone of Newfoundland, antimony occurs as epigenetic, structurally controlled veins within lower Paleozoic felsic volcanic and sedimentary rocks. Antimony veins at Moreton's Harbour are associated with felsic dykes but these were interpreted to be syngenetic and related to volcanogenic processes (Kay, 1981). Elsewhere in the Dunnage Zone the antimony veins appear to be of two types, quartz – arsenopyrite – pyrite – gold – antimony and quartz – antimony. Gold-bearing antimony veins occur at Little River, Kim Lake and Moreton's Harbour.

At Little River and Kim Lake the veins are structurally controlled and a spatial association with granitic intrusive rocks has been noted (Colman-Sadd and Swinden, 1982; Dickson, 1987a). At Little River, evidence has also been presented for two separate styles of mineralization within the same occurrence: 1) arsenopyrite – pyrite – gold (antimony ?), and 2) antimony – quartz (gold ?). This may indicate either a collapsing hydrothermal system that deposited arsenopyrite – gold at higher temperatures and antimony at lower temperatures or two separate mineralizing events. Such a two-stage model involving separate events has been proposed for the Lisglassan – Tullybuck deposit in Ireland (Morris *et al.*, 1986).

Significant antimony veins also occur at Antimony Ridge north of Bay d'Espoir and at the Hunan – Xingchang – Szechuan prospects (Beaver Brook deposits) south of Glenwood. These occurrences comprise coarse acicular stibnite crystals developed within extensional veins that contain only minor quartz (Pickett, 1993, Tallman, 1991a). Tallman (*op. cit.*) suggested that the Hunan was epithermal and related to the nearby Mount Peyton Intrusive Suite. The paucity of gold within the antimony veins was attributed to a possible stacked model with gold deposited at higher temperatures and deeper levels and antimony precipitated at shallower depths and lower temperatures.

Barite-Rich Veins

The only known auriferous barite vein system within the Dunnage Zone is the Glitter Pond prospect. The prospect is hosted by sericitic felsic tuff in the Tulks Hill volcanics of the Victoria Lake Group. The mineralization comprises a mixture of white and greyish-white barite, quartz and small clots and bands of pyrite (Howse, 1992). A grab sample from the prospect assayed 2.55 g/t gold and 14.0 g/t silver (Thurlow and Barbour, 1985; Thurlow *et al.*, 1987). Diamond drilling intersected a zone that assayed 0.22 g/t gold over 7.6 m.

Altered Wall Rock ± Quartz Veins

Dubé (1990) described gold mineralization in western Newfoundland, which developed in the altered wall rock adjacent to the quartz veins, as "an altered wall-rock type" of mesothermal deposit. This altered wall-rock type overlaps the auriferous quartz vein and disseminated deposit types. The auriferous quartz veins locally have extensive gold-enriched wall-rock haloes that may extend many metres from the vein. The disseminated style differs in two ways in that it lacks quartz veining and the alteration is predominantly silicification as opposed to Fe-carbonate. The characteristics of this style of gold mineralization are presented in Table 26.

Table 26. Characteristics of the altered wall-rock class of mesothermal gold mineralization from central Newfoundland

Class 2: Altered wall rock (± quartz veins)	
Host Rock	sheared gabbro, mafic and intermediate volcanic rocks
Wall-rock Alteration	*gabbro* – intense Fe-carbonate, disseminated pyrite and arsenopyrite, silica chlorite and leucoxene (e.g., Duder Lake and Clutha)
	intermediate volcanic rocks – silica, sericite, disseminated pyrite, arsenopyrite and minor Fe-carbonate (e.g., Little River and Kim Lake)
Gangue Minerals	pyrite, arsenopyrite, quartz and carbonate
Size	*Clutha* – gabbro dykes 2 to 20 m thick with strike lengths up to 400 m, mineralized sections up to 2 m wide with strike lengths of 2 to 20 m
	Little River – 1 to 4.5 m thick, strike length of approximately 450 m
Gold	inclusions within pyrite and arsenopyrite

Table 27. Characteristics of the disseminated class of mesothermal gold mineralization from central Newfoundland

Class 3: Disseminated Gold	
Host Rock	serpentinite, felsic volcanic rocks and sandstone
Wall-rock Alteration	*serpentinite* – talc-carbonate (e.g., Burseys Hill)
	felsic volcanic rocks – silica and hematite (e.g., West Tulks)
	sandstone – silica and disseminated pyrite and arsenopyrite (e.g., Chiouk Brook)
Size	unknown
Gold	inclusions within pyrite and arsenopyrite (?)

In the altered wall-rock style, economic concentrations of gold occur in the wall rock adjacent to the quartz veins. Gold may or may not be developed within the veins. This style is best developed within mafic (Fe-rich) rocks, particularly gabbro, and is widely developed in the Great Bend – Pauls Pond and Glenwood – Notre Dame Bay areas and appears to offer the best potential for economic concentrations of gold.

Quartz veining associated with the altered wall-rock style exhibit the same characteristics as the auriferous quartz vein style. The veins are discontinuous and vary from millimetre scale up to greater than 50 cm. They exhibit pinch-and-swell structures, and their orientation and distribution are controlled by the rheological properties of the host rock. The veins typically contain patches and disseminations of pyrite and crystals of arsenopyrite and rarely free gold. The best examples are developed at the Clutha and Duder Lake prospects (Evans, 1991; Churchill *et al.*, 1993).

Disseminated Gold

Disseminated gold mineralization (Romberger, 1988) can be similar in style and setting to mesothermal lode gold mineralization but they typically lack quartz veining. The disseminated style of mineralization is interpreted to form as the result of the migration of hydrothermal fluids away from a fault conduit system into adjacent permeable rock units. Enhanced permeability can result from either mylonitization and micro-fracturing related to shear-zone deformation. Pervasive silicification and fine-grained disseminated sulphides are typically associated with the disseminated style of mineralization. The characteristics of this style of mineralization are outlined in Table 27.

Table 28. Characteristics of epithermal-style gold mineralization and alteration in central Newfoundland

Epithermal-Style Mineralization and Alteration	
Host Rock	felsic volcanic rocks, sandstone and shale
Alteration	*felsic volcanic rocks* – silica, alunite, pyrophyllite, sericite, orpiment, realgar, native sulphur and pyrite (e.g., Bobbys Pond)
	sedimentary rocks – silica, pyrophyllite, kaolinite and pyrite (e.g., the Aztec and The Outflow)
Style of alteration	*felsic volcanic rocks* – pervasive silicification (pyrite forms semi-massive patches associated with pyrophyllite)
	sedimentary rocks – multiple-stage hydrothermal brecciation accompanied by silica flooding (textures include cockade textures, chalcedonic banding)
Size	*Bobbys Pond* mapped portion up to 750 m wide and 4 km long, extent unknown
	Aztec strike length approximately 330 m, drill tested to a vertical depth of approximately 75 m
	The Outflow strike length approximately 3 km
Gold	associated with pyrite, typically low grade 1 to 3 g/t.

Epithermal-Style Gold Mineralization

In contrast to mesothermal deposits, epithermal gold deposits form in shallow crustal settings, not necessarily in regional structures, and are commonly associated with meteoric water-dominated fluids in fracture systems (Field and Fifarek, 1985). Epithermal-style alteration and mineralization has been reported from the Bobbys Pond alteration zone and the Aztec and the Outflow prospects (Evans, 1991, 1992). These epithermal systems exhibit intense hydrothermal brecciation, pervasive silicification, quartz veining and strong argillic alteration. Gold values associated with these occurrences are typically low, from 1 to 3 g/t. The characteristics of the epithermal style of mineralization are outlined in Table 28.

SETTING OF GOLD MINERALIZATION IN THE EASTERN DUNNAGE ZONE

Regional Controls

The majority of gold occurrences within the eastern Dunnage Zone cluster within four areas (Figure 2): 1) Victoria Lake – Millertown, 2) Bay d'Espoir, 3) Great Bend – Pauls Pond, and 4) Glenwood – Notre Dame Bay (Evans, 1994). These areas are characterized by complex networks of northeast-, north-northeast- and northwest-trending linears that are visible on topographic and orthophoto maps. Many of these linears are interpreted as major fault zones, e.g., the Lloyds Valley and Victoria Lake fault systems in the Victoria Lake – Millertown area, the Day Cove Thrust and Collins Brook Fault in the Bay d'Espoir area, faults related to the emplacement of the ophiolitic complexes in the Great Bend – Pauls Pond area, and the Dog Bay Line, Appleton and Salmon Pond linears and faults related to the Gander River Complex in the Glenwood – Notre Dame Bay area.

Ophiolitic sequences within Newfoundland are known to host significant concentrations of gold, particularly within rocks of the Betts Cove and Point Rouse complexes on the Baie Verte Peninsula. However, in the Glenwood – Notre Dame Bay area, the majority of gold occurrences are located well to the west of the ophiolitic rocks of the Gander River Complex and appear to be spatially associated with the Dog Bay Line, a major regional structure, which demonstrably affects Silurian sequences (Currie, 1993). Rocks of the Gander River Complex are interpreted to have been structurally emplaced in the Early Ordovician as they are nonconformably overlain by conglomerate of the Davidsville Group (Blackwood, 1982). The apparent lack of significant concentrations of gold within the Gander River Complex may indicate that fault systems that affected these rocks during the Silurian were either not deeply rooted or were too distal from deep-seated structures to have tapped auriferous fluids. Both mesothermal- and epithermal-style gold occurrences are spatially associated with these regionally extensive structures and appear to be mainly independent of host-rock lithology or age; and structural setting is considered to be the most important primary control on the site of gold deposition.

Within the eastern Dunnage Zone, mesothermal gold occurs in almost every major rock unit with the exception of the metasedimentary rocks of the Gander Zone (i.e., Meelpaeg and Mount Cormack subzones) which are exposed within the study area. This may have some bearing on the source or sources of the hydrothermal fluids responsible for the gold mineralization.

The diverse variety of rock that host gold occurrences in the eastern Dunnage Zone indicates that lithological control influenced the setting of gold deposits only on a local scale. Rheological (the ability for open-space fractures to form during deformation) and physiochemical (Fe- or C-rich) properties of the host rock influence the actual site of gold deposition. Iron-rich rocks (those with a high Fe/(Fe+Mg) ratio (Barley and Groves, 1990) and graphitic sediments (Colvine *et al.*, 1984) appear to be selectively mineralized.

Gabbroic rocks are Fe-rich and rheologically ideal for the formation of either auriferous quartz vein or altered wall-rock-style gold deposits. The numerous gabbroic bodies in the northeastern Dunnage Zone may prove to be the best exploration targets as they exhibit the most favourable characteristics for the development of economic concentrations of gold mineralization.

Depth of Formation

The majority of mesothermal gold occurrences in the eastern Dunnage Zone appear to have formed at somewhat shallower depths than typical of mesothermal systems in general because, 1) they are associated with dominantly brittle features in a brittle – ductile setting, 2) some quartz veins exhibit comb and vuggy textures indicative of open-space filling, 3) alteration associated with some occurrences is similar to that typically associated with epithermal alteration (i.e., intense argillic), and 4) epithermal and mesothermal types of mineralization occur proximal to each other (e.g., the epithermal Aztec prospect and the mesothermal A-Zone Extension showing). The eastern Dunnage Zone mesothermal occurrences may have formed in an environment transitional between epithermal and the "true mesothermal styles" of mineralization commonly described in the literature. A shallower depth of formation compared to Archean mesothermal ductile – brittle quartz-vein deposits was also suggested by Dubé (1990) for quartz-vein systems in western Newfoundland.

Hydrothermal Fluid Sources

The clustering of the central Newfoundland gold occurrences along linear structures or within structurally complex areas (Figure 2; Evans, 1994) indicates that these structures served as conduits for large-scale fluid flow. The extensive carbonate alteration haloes associated with many of these mesothermal gold occurrences and the composition of fluid inclusions in many of the quartz veins suggest that the fluids were CO_2-rich (Evans and Wilson, 1994) and are possibly indicative of metamorphogenic fluids (Colvine *et al.*, 1984; Kerrich, 1989b). Also, there is a spatial association between many of these occurrences and the large Siluro-Devonian batholiths i.e., the North Bay Granite and the Mount Peyton Intrusive Suite. These intrusions may have, in some instances, provided, 1) a magmatic source for many of the metals, or 2) a heat source that promoted hydrothermal circulation and enhanced the remobilization of pre-existing mineralization. However, many of the gold occurrences are demonstrably younger than these intrusive rocks and, in some instances, occur within fault zones that cut the intrusions.

At the Midas Pond prospect, the mineralizing fluids are interpreted to have been carbonate- and fluoride-rich, slightly acidic and within a temperature range of 250 to 300°C (Evans, 1993b). These fluids are interpreted to have originated through metamorphic dehydration and decarbonation of mixed island-arc and continental crustal rocks. Gold precipitation resulted from the reaction of these fluids with the Fe-rich mafic rocks. Pre-existing and simultaneously crystallizing pyrite served as nuclei for gold precipitation.

A similar interpretation is suggested by Churchill *et al.* (1993) for the Duder Lake gold prospects. Hydrothermal fluids, rich in CO_2, As, Sb and Au, were derived through metamorphic dehydration reactions of possible Gander Zone basement rock. These fluids were focused into, and ascended along, permeable fault zones (possibly the Dog Bay Line) until the Fe-rich rocks (gabbro) were encountered and disequilibrium occurred. Gold precipitation occurred together with arsenopyrite and pyrite.

The central Newfoundland occurrences (Derek Wilton, personal communication, 1995) indicate that the CO_2-rich fluid inclusions have salinities between 2.5 to 5.0 weight percent NaCl and have homogenization temperatures between 207 to 362°C. The homogenization temperatures were interpreted to be close to the actual trapping temperatures due to the shallow nature of the quartz veins. This data is similar to other mesothermal lode gold deposits described by Kerrich (1989b).

Light stable isotope data ($\delta^{18}O$, 6.4 to 17.4; $\delta^{13}C$, −4.5 to −14.6; and $\delta^{34}S$, −5.3 to 10.6 for pyrite and −0.7 to 4.8 for arsenopyrite) collected form selected gold occurrences in central Newfoundland (Evans and Wilson, 1994) exhibit a range of values that are more variable than typical of Archean or younger mesothermal gold camps. The variablity of this data was interpreted to reflect two possible processes: 1) variation in fluid characteristics due to geological composition of the deep source area; and 2) variation in fluid type (i.e., deep crustal versus meteoric). Evans and Wilson (1994)

suggest that $\delta^{18}O$ and $\delta^{34}S$ data exhibit a provinciality that reflects different geological blocks juxtaposed across major lineaments (i.e., Dog Bay and Noel Pauls lines). For example, gold occurrences with $\delta^{18}O$ values for quartz >15 per mil and $\delta^{34}S$ values for pyrite < 1.2 per mil are restricted to the eastern Dunnage Zone in areas dominated by sedimentary sequences. Gold occurrences with $\delta^{18}O$ values for quartz < 12.7 per mil and $\delta^{34}S$ values for pyrite >4.3 per mil occur in areas dominated by volcanic or large bodies of intrusive rocks. The wide range of $\delta^{13}C$ values for carbonate collected from the auriferous quartz veins were interpreted to indicate more than one source of carbon. Values near −5 to −7 per mil were interpreted to be typical of other mesothermal gold camps (D. Evans, unpublished data). Much lower $\delta^{13}C$ values were interpreted to suggest a substantial organic (sedimentary) component.

A regional isotopic geochemistry study (Nd and O) of granitoid intrusions from Newfoundland indicated that the late orogenic suite (460 – 410 Ma) within the eastern Dunnage Zone had strongly negative Σ_{Nd} and high $\delta^{18}O$ values (Fryer *et al.*, 1992). These results were interpreted to indicate that the late orogenic suite was derived mainly by the melting of Gander Group supracrustal rocks. Included in this suite are the North Bay Granite and the Mount Peyton Intrusive Suite. Granitic rocks along the south coast exhibited weaker negative Σ_{Nd} values that are interpreted to represent derivation from Precambrian basement. It is interesting to note that economically significant gold occurrences, other than those in the Victoria lake area, appear to be geographically restricted to areas where the late orogenic intrusive rocks have a strong negative Σ_{Nd} signature.

In areas dominated by felsic volcanic rocks, such as the Victoria Lake Group, gold occurs within pyrite-rich quartz veins (e.g., Midas Pond and Valentine Lake) that lack significant concentrations of either arsenopyrite or stibnite. In contrast, areas dominated by sedimentary rocks, such as in the eastern Dunnage Zone, have auriferous quartz viens that contain significant concentrations of arsenopyrite and/or stibnite. At a regional scale, distribution maps of Au, As, and Sb in lake sediments (Davenport and Nolan, 1991) indicate high background levels for these elements, particularly As and Sb, in Exploits Subzone and post-accretionary rocks. These sequences either had high background values to begin with (i.e., are related to syngenetic mineralization) or the element anomalies resulted from epigenetic mineralization related to regionally extensive hydrothermal activity (Davenport and Nolan, 1991). Both As and Sb are known to be associated with many of the massive-sulphide deposits such as those hosted by the Tulks Hill volcanics of the Victoria Lake Group, suggesting that the distribution may be in part primary. However, areas with extensive gold mineralization associated with significant concentrations of arsenopyrite and stibnite (Glenwood, Great Bend and Bay d'Espoir) exhibit high concentrations of both these elements in lake sediments, suggesting that the As and Sb may be related to gold mineralization.

The spatial association of central Newfoundland gold occurrences with complex regionally extensive structures, the CO_2-rich fluid inclusions and light stable isotope data all indicate a metamorphogenic fluid source. These fluids were locally interactive with shallower meteoric fluids in the near surfac. Such fluids could have been derived from either allocthonous metamorphosed Dunnage Zone sequences and/or the underlying metasedimentary rocks of the Gander Zone (Figure 46). The complex structures provided an extensive plumbing system that allowed the fluids access to the near surface environments.

The nature of the host rocks, i.e., mineralogy (primary and greenschist-facies minerals) and rheological properties (brittle–ductile behaviour) provided conditions favourable for gold deposition (i.e., changes in the physical environment that produced rapid fluctuations in gold solubility and favoured demixing of hydrothermal fluids). Greenschist-facies rocks worldwide are known to provide ideal conditions for the formation of gold deposits (Robert, 1991).

If the metamorphosed clastic sequences (as exposed in the Mount Peyton and Meelpaeg subzones; Williams *et al.*, 1988) were the source of gold and antimony it may explain why significant mineral occurrences are lacking in these sequences and why they are characterized by low Sb, and locally Au and As on lake-sediment geochemical maps. Localized high background values of these elements over Gander Zone rocks (i.e., the area north of Gander Lake) may be the product of glacial dispersal. St. Croix and Taylor (1991) indicate that ice-flow direction in this area was from the west, originating in an area with a high density of gold mineralization (Davidsville Group and Gander River Complex).

Controls on the Age of Gold Mineralization

Epigenetic gold mineralization is considered to be characteristic of late-stage convergent orogenic activity (Robert, 1991). This mineralization could be as much as tens of millions of years post-peak metamorphism and plutonism due to the evolution of the tectonically overthickened crust. Central Newfoundland was affected by two major orogenic pulses; 1) the Ordovician Taconian and Penobscot orogenies that involved ophiolite emplacement onto the opposing continental margins of Iapetus (Colman-Sadd *et al.*, 1992); and 2) a climactic Silurian orogeny (ca. 440 – 390 Ma), which produced widespread regional deformation, metamorphism, plutonism and subaerial volcanism (Dunning *et al.*, 1990).

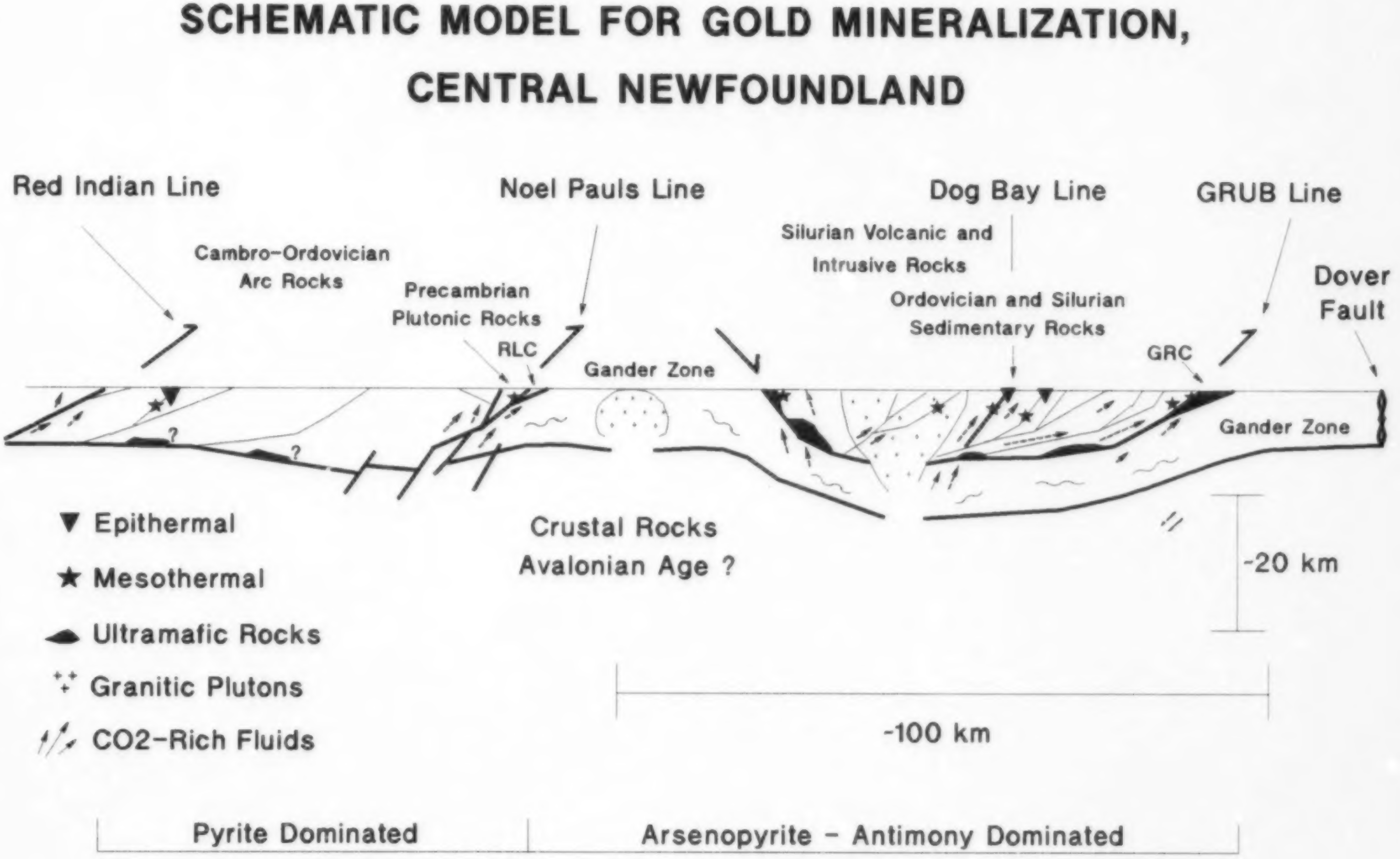


Figure 46. *Geological cross-section through the eastern Dunnage Zone, illustrating possible hydrothermal fluid sources.*

In central Newfoundland, the epigenetic gold occurrences are related to the climactic Silurian orogeny because, 1) many of these gold occurrences are associated with regional structures that demonstrably affect Silurian sedimentary sequences (i.e., Botwood and Indian Islands groups and the Rogerson Lake Conglomerate) and Siluro-Devonian intrusive rocks (i.e., Mount Peyton Intrusive Suite), 2) many of these same occurrences are hosted by Silurian or younger rocks, and 3) many of the gold occurrences contain significant concentrations of arsenopyrite and/or stibnite and lake sediment As and Sb anomalies are widely distributed over both Exploits Subzone and post-accretionary rocks suggesting that hydrothermal activity was widespread and postdated many of the younger sequences.

This mineralizing process may have begun as early as 420 Ma (i.e., slightly younger than the Botwood Group and gabbroic rocks which intrude it). Based on $^{40}Ar/^{39}Ar$ metamorphic cooling ages obtained from the Victoria Lake Group (Kean and Evans, 1988) and the Davidsville Group (O'Neill, 1991), the effects of the regional Silurian deformation appear to have mainly subsided by about 375 Ma. Therefore, the gold occurrences appear to be bracketed between 420 to 375 Ma. Local remobilization of gold mineralization along major structural breaks could have occurred as late as the Carboniferous.

SUMMARY CONCLUSIONS

Epigenetic gold mineralization within the eastern Dunnage Zone is a widely developed and potentially economically significant style of mineralization. These gold occurrences can be subdivided into epithermal and mesothermal styles that are both spatially associated with major regionally extensive structures. These structures are the primary control on the location of epigenetic gold mineralization. Lithological control (i.e., physiochemical and rheological properties) influences the site of mineralization on a local scale. Host-rock age does not have any bearing on the gold mineralization.

Epithermal-style gold occurrences exhibit intense hydrothermal brecciation and variable argillic alteration. Gold concentrations associated with this style are generally low and these occurrences have received only limited exploration work.

The mesothermal gold occurrences are the most widely developed style of gold mineralization in the Dunnage Zone. They can be subdivided into auriferous-quartz vein, altered wall-rock (± quartz veins) and disseminated subclasses. These occurrences are interpreted to be relatively shallow in origin and may represent a style of mineralization transitional between the typical mesothermal veins (e.g., Archean) and epithermal occurrences.

The gold occurrences within the eastern Dunnage Zone cluster within four geographic areas: Victoria Lake – Millertown, Bay d'Espoir, Great Bend – Pauls Pond, and Glenwood – Notre Dame Bay. These areas were strongly affected by the Silurian Salinic Orogeny with intense deformation, metamorphism and plutonism. The gold occurrences are interpreted to be late syn- to post Salinic.

Epigenetic gold within the eastern Dunnage Zone is a significant exploration target with excellent potential for further discoveries. Exploration activity between 1984 and 1991 resulted in the discovery of approximately 90 gold occurrences. Extensive areas of the eastern Dunnage Zone remain largely unexplored.

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APPENDIX 1

LISTING OF PROJECT OUTPUTS

GEOLOGICAL SURVEY

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APPENDIX 2

PARTIAL LISTING OF GOLD OCCURRENCE, EASTERN DUNNAGE ZONE

Victoria Lake – Millertown								
Name	No.	UTM	MODS	Host Rock	Mineralogy	Assay Results	Comments	References
Victoria Lake South	2 QV	454850 5343550	12A/04 Au002	Victoria lake Gp. sheared gabbro	pyr, (Au)	Lassila (1982) 0.9 g/t Au, 0.56% As (gs)	Frost-heaved outcrop	Lassila (1982) Barbour *et al.* (1988)
Woods Lake	3 QV	441000 5334500	12A/04 Au003	Bay du Nord Gp. metasedimetary rocks	asp,(Au)	Barbour *et al.* (1988) 11.93 g/t Au (gs, location ?) Evans (1993) 0.4 g/t Au (gs)	One trench exposed a 25 cm thick schistosity parallel quartz vein with disseminated and veinlets of asp	Barbour *et al.* (1988)
Pats Pond	4 QV	466310 5359450	12A/06 Ag001	Victoria Lake Gp. felsic volcanic rocks	pyr,po,cp, gn,sp,asp, sch,(Au)	Sterenberg (1979) 2.9 oz/t Ag, 0.0182% Cu, 0.97% Pb, 0.61% Zn, 322 ppm W (cs over 1.5 m wide quartz vein) Float 0.6 oz/t Au, 367 oz/t Ag, 0.05% Cu, 7.5% Pb, 1.1% Zn 2.9% WO_3, 0.3% Bi	Mineralized quartz float discovered by Grimes-Graeme in 1934. Chip sampled by Hudson's Bay Oil and Gas Company Limited, diamond drilling intersected a zone of narrow, discontinuous quartz veins. Figure 2.1 illustrates the distribution of mineralized float along Pats Brook	Grimes-Graeme (1934) Sterenberg (1979); Barbour *et al.* (1989)
Frozen Ear Pond	8 QV	489740 5359200	12A/06 Au004	Valentine Lake Quartz Monzonite	NA	NA	Quartz veins	Kean and Evans (1988)
Trond-hjemite Hill	10 QV	495650 5364350	12A/06 Au006	Valentine Lake Quartz Monzonite	py, (Au)	10.0 to 20.0 g/t Au (gs)	Quartz – tourmaline – pyrite veins	Barbour (1990)
Victoria Rapids	11 QV	495070 5362570	12A/06 Au007	Rogerson Lake Conglomerate	(Au),cp	up to 32.8 oz/t Au (gs)	Narrow quartz veins	Barbour *et al.* (1989)
Victoria Bridge	12 QV	494790 5361860	12A/06 Au008	Rogerson Lake Conglomerate	(Au)	2.1 g/t Au (gs)	Quartz vein (?) in sheared argillite and sandstone	Barbour *et al.* (1989)
Halfway Pond South	13 QV	476370 5367660	12A/06 Au009	Victoria Lake Gp. felsic volcanic rocks	gn (Au, Ag)	2.1, 2.6 and 1.6 g/t Au and 14 g/t Ag (gs)	Quartz veins	Thurlow *et al.* (1985)
Long Lake	14 QV	485750 5363650	12A/06 Au010	Victoria Lake Gp. granite	py, (Au)	Up to 5 g/t Au (gs)	Extensional quartz veins developed in a granite which intruded into sheared pillow lava. Veins developed over a width of 2-3 m and a strike length of 10-15 m	Tuach (1992) C. McKenzie pers. comm., 1994

Glitter Pond	15 QV	473660 5363670	12A/06 Ba001	Victoria Lake Gp. sericitic felsic tuff	ba, pyr (Au, Ag)	Thurlow and Barbour (1985); Thurlow *et al.* (1987) 2.55 g/t Au and 14.0 g/t Ag (gs) DDH 0.22 g/t Au over 7.6 m Howse (1992) up to 54.18% $BaSO_4$ (gs)	Vein or band of white to greyish-white barite and quartz exposed for approximately 20 m along a small, barren northeast-trending ridge. Small clots and bands of pyr occur locally. Abitibi-Price-Asarco (date unknown) trenched and tested the prospect with 3 short diamond-drill holes	Thurlow and Barbour (1985); Thurlow *et al.* (1987); Howse (1992)
South Quinn Lake	16 QV	508050 5363550	12A/07 Au002	unnamed metasedimetary rocks	asp, (Au)	11.7 g/t Au, 16 g/t Ag over 0.6 m (cs)	Quartz – asp vein in sheared Fe-carbonate altered metasedimentary rocks	Collins and Squires (1991)
Shoulder Blade Lake	17 DIS	561750 5394120	12A/09 Au001	Victoria Lake Gp. felsic volcanic rocks	asp, (Au)	0.6 g/t Au	Disseminated euhedral asp in hematized and silicified felsic volcanic rocks	Kean and Evans (1988)
Balloon Pond	18 QV	535230 537600	12A/10 Au001	unnamed sequence of sedimentary and felsic volcanic rocks	cp, gn, sph, (Ag, Au)	1.1 g/t Au; 0.23 g/t Au, 17 g/t Ag, 325 ppm As, 444 ppm Cu, 0.83% Pb, >1% Zn; 0.03 g/t Au, 29 g/t Ag, 40 ppm As, >1% Cu (gs)	Quartz – base-metal veins and disseminated sulphides in chloritized and sericitized felsic volcanic rocks and quartzite	Rodgers (1988)
Spencers Pond	19 DIS	529850 5372500	12A/10 Au003	Victoria Lake Gp. felsic volcanic rocks	pyr, (Au)	0.9 g/t Au	Pyrophyllitized, sericitized and chloritized tuffaceous rocks	Kean and Evans (1988)
Victoria Mine Gold	20 QV	521750 5398400	12A/10 Au005	Victoria Lake Gp. felsic volcanic rocks	asp, (Au)	1.95 g/t Au (gs), 0.95 g/t Au (cs)	Quartz – asp veins	Barbour *et al.* (1988)
Victoria Mine West Inco	21 QV	520300 5397750	12A/10 Au006	Victoria Lake Gp. felsic volcanic rocks	asp, (Au)	2.2 g/t Au (gs)	Quartz – asp veins	Phipps (1987)
Hoffes Pond Au	22 QV	514630 5389860	12A/10 Au007	Victoria Lake Gp. felsic volcanic rocks	pyr, (Au)	DDH 1.73 g/t Au over 1.3 m 0.77 g/t Au (gs)	Quartz – pyr vein	Bell (1988)
Roebucks Falls Gold	24 QV	495430 5378580	12A/11 Au001	Victoria Lake Gp. felsic volcanic rocks	pyr, (Au)	1.18 g/t Au (gs)	Quartz – pyr – pyrophyllite – sericite altered shear zone	Barbour *et al.* (1988)
Star River		?	12A/11	Victoria Lake Gp.	(Au)	4.1 g/t Au, 24 g/t Ag (gs)	Quartz vein	Tuach (1992)

Bay d'Espoir								
Name	No.	UTM	MODS	Host Rock	Mineralogy	Assay Results	Comments	References
Little Spruce Pond #6	25 QV	610800 5309760	1M/13 As002	Isle Galet Fm. felsic tuff	asp, pyr, po, tet, sb, gn, sp, cp	Trace base metals, no anomalous Au values	Discovered in 1985 by Westfield Minerals, tested with 23 trenches and 1 diamond-drill hole. Three foliation parallel bands of silicification and quartz veining are developed within felsic quartz crystal tuff. In drill core, these bands are between 3 and 9 m thick. Quartz, sericite, pyr and po are common to the three bands. Dumortierite, pyrophyllite and fuchsite occur in the central and southeastern band. Asp, tet, bo, sb, gn, sp, cp and native S (?) are restricted to the southeastern band (McHale and McKillen, 1987). Sulphide-bearing, crosscutting quartz – carbonate veins are pervasively developed in the felsic tuff between the siliceous bands	McHale (1985b); McHale and McKillen (1987, 1988, 1989)
Bowers Tickle/ Bowdridge	26 QV	596175 5297050	1M/13 Au001	Riches Island Fm. chlorite – sericite schist	pyr, sb, asp, po, (Au, Ag)	Meikle (1955) 13.71 g/t Au and 17.14 g/t Ag (gs), up to 3.36 g/t (60 cm. cs). Swinden (1979), (unpub.) 3.0 g/t Au and 0.5 g/t Ag (60 cm cs) Evans (1993) 3.1 g/t Au and 0.3 g/t Ag (gs)	Series of foliation parallel smokey-grey quartz – chlorite veins up to 20 cm wide and smaller crosscutting quartz veinlets. Veins pinch and swell. Needles of asp and sb form small patches and flecks within the veins. The zone is approximately 1 m thick and is exposed for approximately 10 m. Host rock is silicified chlorite schist with abundant disseminated asp. Mineralization appears to be developed along a small antiformal hinge which plunges 10-20° toward 250°	Meikle (1955) Colman-Sadd and Swinden (1982) O'Donnell (1987)
Long Jacks Bight/ Long Jacks Lip	27 QV	595900 5296125	1M/13 Au002	Isle Galet Fm. felsic tuff	pyr, po, asp	Meikle (1955) Trench 5: 12.34 g/t Au and 17.14 g/t Ag (gs) Trench 6: 0.69 g/t Au and 3.43 g/t Ag Trench 8: 0.34 g/t Au Swinden (1979) (unpub.) Trench 5: 0.05 g/t Au and 70 g/t Ag and 2100 g/t As (gs)	8 trenches circa 1935. Host rock consists of rusty, graphitic-quartz sericite schist. Extensional milky-white, locally vuggy quartz veins up to 30 cm thick contain fine stringers and patches of sulphides. Coarse muscovite is developed along the vein margins. Three vein sets are present: 1) 50°/55°W (cleavage parallel); 2) 90°/20°N; and 3) 120°-140°/30°-80° SW. Exposed thickness of zone approximately 1.5 m. Colman-Sadd and Swinden (1982) reported that the zone could be traced for approximately 100 m. along strike	Jewell (1939); Meikle (1955); Colman-Sadd and Swinden (1982); Huard (1987a; and b)

Little River #1	28 DIS	608525 5309100	1M/13 Au003	Isle Galet Fm. siliceous fine-grained clastic sedimentary rocks	pyr, asp (Au)	1.6 g/t Au (1.0 m cs)	Disseminated pyr and asp	McHale (1985b)
38 West	32 ALT	603750 5304450	1M/13 Au010	Isle Galet Fm. intermediate to felsic tuff	asp, pyr, po, sb, (Au)	Trench 87-83: 1.843 g/t Au and 6984 ppb Sb (1.4 m. cs) and 0.158 oz/t Au (1.2 m cs) Trench 87-84: 1.8 g/t Au (0.5 m. cs) Trench 87-85: 2.76 g/t Au (0.5 m. cs)	14 trenches (mostly collapsed). Host rock is strongly weathered red-brown to dark green, weakly foliated intermediate to felsic tuff with narrow zones of mottled green-white-grey chloritic tuff and dark grey to black pelite. Widespread chlorite-biotite and dolomite is developed with localized sericite-rich zones. Quartz-sulphide veins throughout. 1-20% asp, pyr and po, mainly as disseminations, locally as thin laminations of asp (<1 mm) over widths of 1-10 m. Sulphide-rich zones (5-20%) vary in width between 0.5 and 3 m. Au appears to associated with the asp. Sb (berthierite, stibnite, senarmontite, valentinite and gudmundite) are present in the trenches with the best gold values, but gold concentrations do not appear to be related to the sb content. The sb occurs in pods, nodules, quartz-carbonate lenses and quartz veins. The best Au assays appear to be associated with a strongly developed, crosscutting fabric, which may be fault related	McHale and McKillen (1988)
42 West	33 ALT	603000 5303900	1M/13 Au011	Isle Galet Fm. intermediate tuff	asp, sb (Au)	3.06 g/t Au (1.5 m. cs)	Single trench, exposure limited by deep overburden. Disseminated asp and sb (berthierite, stibnite and gudmundite)	McHale and McKillen (1988)
90 West	34 UK	599100 5301000	1M/13 Au012	Isle Galet Fm.	(Au)	NA	NA	McHale and McKillen (1988)
97 West	35 UK	598750 5300750	1M/13 Au013	Isle Galet Fm.	(Au)	2.38 g/t Au (5 m. cs) 3.74 g/t Au (gs)	NA	McHale and McKillen (1988)
Golden Grit	37 QV	595550 5313300	1M/13 Au015	St. Josephs Cove Fm. phyllitic pelite and minor interbedded thin siltstone layers	pyr, po, sp, gn, (Au)	Pickett (1993), Trench 4: 16.9 g/t Au (gs of rusty quartz pod) Trench 7: 4.5 g/t Au, 33 ppm As and 4 ppm Sb (1.0 m cs)	Seven trenches and 41 test pits tested area of anomalous gold grains in till. Trenches have been back-filled. Quartz veins within sp and gn typically assay <1 g/t Au. These veins range between a few cm to 1 m in width	Pickett (1990, 1991, 1993)

Name	No.	UTM	MODS	Host Rock	Mineralogy	Assay Results	Comments	References
Rattling Brook Pond/ Grandy Pond	38 QV	582600 5297900	1M/13 Mo002	Riches Island Fm. staurolite-biotite schist	mo, Bi, (Au)	Winek (1954), 6.5 g/t Au and 0.14% Mo (quartz vein gs) 3.73% Bi (quartz porphyry lenticle gs)	The gold is associated with vitreous, lenticular quartz veins developed along a thrust fault located at the western end of Grandy Pond (Weink, 1954), the thrust separates the St. Josephs Cove and Riches Island formations. The area was re-examined by Norman (1985), however, no anomalous assay values or mineralization were reported from the area of Weink's original discovery. Weink (1954) also reported significant quartz veining in the stream bed to the west of Grandy Pond. The vein (s), which is at least 3 m thick and can be traced westward along the thrust for approximately 100 m, contains bands of coarse, massive pyr up to 10 cm. thick (Norman, 1985). Assays indicate that the vein contains anomalous Au (< 1 g/t) and up to 38 g/t Ag (Norman, 1985). Quart vein and mineralized float to the east and west indicate a possible strike length potential in excess of 3 km	Weink (1954) Norman (1985)
Antimony Ridge	39 QV	594750 5314050	1M/13 Sb002	St. Josephs Cove Fm. phyllitic pelite	sb	Pickett (1993) Assay results indicated that the Sb-rich veins are not anomalous in Au.	Coincident Sb soil geochemistry anomaly and 1100 m long, 50 m wide boulder train consisting of angular, semi-massive sb-quartz boulders. 15-20 cm wide sb-bearing, vuggy quartz vein exposed by trenching. Coarse-grained pyr occurs locally within the quartz veins. Host rocks are intensely weathered pelites	Pickett (1990, 1991, 1993)
Le Pouvoir #2	40 QV	613125 5311650	1M/14 Sb001	Isle Galet Fm. chlorite schist	pyr, sb, asp, (Au)	McHale (1985b) 1900 ppb Au, 2.855% Sb (cs over 0.5 m)	8 trenches excavated by Westfield Minerals in 1985 to test gold soil geochemical anomalies. Pyr, sb, rare asp occurs as disseminations and massive patches within quartz lenses developed in quartz–carbonate schist. 1 diamond drillhole 1987 failed to intersect significant gold mineralization	McHale (1985b) McHale and McKillen (1987)
Le Pouvoir #3	41 QV	613050 5311850	1M/14 Sb002					

Le Pouvoir Main	42 QV	611800 5310650	1M/14 Sb003	Isle Galet Fm. chlorite schist	pyr,sb, asp, (Au)	McHale (1985b) 30.7% Sb and 235 ppb Au (cs over 30 cm) Trench Results up to 0.841% Sb and 22 ppb Au (cs over 0.5 m)	Discovered by Hudson's Bay Oil and Gas in the 1970s, 2 trenches excavated by Westfield Minerals in 1985. Disseminated pyr and sb within banded quartz – carbonate – chlorite schist, Magnetite-rich bands developed locally. Massive sb occurs in foliation parallel quartz lenses which average 10 by 30 cm. A diamond-drill hole, drilled by Westfield Minerals in 1987, intersected the mineralized horizon but assay results were not significant	McHale (1985) McHale and McKillen (1988)
Kim Lake #1	43 QV	622100 5320700	2D/03 Pb001	Isle Galet Fm. pelitic schist	gn, sp, cp, (Ag, Au)	Wall (1956): 40% Pb, 8% Zn, 2% Cu, 6 oz/t Ag, 0.6 oz/t Au (quartz vein gs) Dean (1978b): 2% Pb, 8% Zn, 0.06% Cu, 8.4 ppm Ag, 0.15 oz/t Au (quartz vein gs) Dickson (1987a): 185 ppm Pb, 894 ppm Zn, 44 ppm Cu, 8 ppb Au (quartz vein gs)	60-90 cm long, 13-25 cm wide quartz vein discovered by George Willcott (Wall, 1956). Trenched and stripped by NALCO (Wall, 1956). NALCO geologists (Berrange, 1955; Wall, 1956) indicated that the mineralized zone was developed over a width of 30 cm along a shear zone which was traced 35 m to the east. Stripping indicated that the mineralization was less extensive than anticipated. Dean (1978) described the mineralization as consisting of disseminated and quartz-vein-hosted sulphide minerals. Subsequent workers, Swinden (1980) and Dickson (1987a), described the mineralization as sparse	Berrange (1955) Wall (1956a) Dean (1978b) Swinden (1980) Dickson (1987a)

Great Bend - Pauls Pond

Name	No.	UTM	MODS	Host Rock	Mineralogy	Assay Results	Comments	References
Coy Pond	45 UK	599950 5361450	2D/05 Au001	Coy Pond Complex, trondhjemite	pyr, Au	Saunders (1986) samples were all below the detection limit for gold.	Visible gold was discovered during the preparation of a geochronology sample. Exploration work failed to duplicate the results	Dunning and Krogh (1985); Saunders (1986)

Name	No.	UTM	MODS	Host Rock	Mineralogy	Assay Results	Comments	References
Middle Ridge	46 QV	640350 5372500	2D/06 Au001	Middle Ridge Granite, quartz-feldspar porphyry	pyr, asp sch, (Au)	1070 ppb Au (gs)	Extensive area of auriferous till outlined in 1983 (Tallman and Gower, 1989). In 1988, Noranda excavated 3 trenches which exposed an area of potassic alteration and quartz veining. The potassic alteration is pervasive and contains minor disseminated pyr. Two generations of quartz veins are present: 1) vuggy, cockscomb-textured quartz veins up to 8 cm wide which contain pyr, sch and (Au); and 2) 1-2 cm wide cross-cutting quartz veins. The vuggy vein set locally forms anastomosing stockwork-like zones up to 30 cm wide. Narrow, 2-5 cm wide zones of blue silicification with disseminated pyr and asp are associated with the first vein set	Tallman and Gower (1989)
Lizard Pond North	49 QV	613600 5380750	2D/11 Au003	Great Bend Complex, peridotite	asp, pyr, (Au)	Mercer (1988a) 1.47 g/t Au (gs) Graham (1989) Trench 1: 0.96 g/t Au (cs over 1.0 m) Trench 2: 0.97 g/t Au (cs over 1.0 m)	Two trenches excavated in 1989 (Graham, 1989) to test 394 ppb Au in soil anomaly reported by Burton (1987). Trench 1 exposed a section of fault brecciated magnesite-altered peridotite with disseminated asp and pyr. Trench 2 exposed a section of silicified, magnesite-altered peridotite	Burton (1987) Mercer (1988a) Graham (1989)
Breccia Pond	50 QV	616900 5380400	2D/11 Au004	Great Bend Complex - Botwood Gp.	asp, pyr, mir, (Au)	Trench 3.24 g/t Au over 1.0 m (cs) DDH 840 ppb Au over 0.7 m	Single trench excavated in 1989. Exposed silicified and magnesite- altered ultramafic rocks cut by narrow fracture-controlled quartz – carbonate veins and stockwork (Figure 2.2). Intense silicification and hematization is associated with the veining. Up to 5% pyr and asp, minor mil. 50 m to the south is a zone of jasperoidal magnesite with vuggy siliceous zones and patches of semi-massive pyr. One diamond-drill hole intersected thin fault bound-slivers of ultramafic rocks separated by shale and sandstone	Graham (1989)
Swan Lake	51 QV	613550 5378550	2D/11 Au005	Botwood Gp.	asp, (Au)	3.1 g/t Au (cs)	Single trench excavated to test source of quartz float. Trench exposed a silicified shear zone with disseminated asp and a 2-m-wide quartz breccia vein	Graham (1989)

A-Zone Extension	53 QV	631150 5388800	2D/11 Au007	Davidsville Gp. greywacke	asp, pyr, (Au)	Trench 2.60 g/t Au over 7.0 m (cs), 1.0 g/t Au over 13.0 m (cs)	Series of trenches exposed an approximately 30 m thick, pervasively chloritized, locally potassically altered greywacke horizon within a sequence of siltstone (Figure 2.3). The greywacke is cut by small, discontinuous asp and pyr-bearing, extensional quartz – carbonate veins and veinlets. The mineralization has been traced for approximately 250 m along strike	Tallman (1989a)
Hornet	54 QV	629800 5388050	2D/11 Au008	Davidsville Gp. felsite	pyr, asp (Au)	9.7 g/t Au (gs) 2.86 g/t Au (cs over 1.0 m)	Small quartz-pyr stringers and 1-2 cm wide vuggy quartz veins developed within locally silicified, fractured and brecciated felsite (?)	Tallman (1989a)
Road Gabbro	55 ALT	635150 5391250	2D/11 Au009	Davidsville Gp. gabbroic intrusion	pyr, asp (Au)	7.9 g/t Au (gs) 2.24 g/t Au (cs over 1.0 m)	Quartz veins within silicified and carbonatized gabbro, which intrudes the Davidsville Gp	Tallman (1989a)
LBNL	56 QV	636550 5391050	2D/11 Au010	Davidsville Gp. granitic intrusion	pyr, asp, (Au)	1.36 g/t Au over 1.0 m, 1.80 g/t Au over 1.0 m (gs)	Silicified granitic intrusive rock with quartz – asp veins. Asp forms coarse patches within the veins and locally mantles the vein margins	Tallman (1989a)
Greenwood Pond #1	58 ALT	628850 5387500	2D/11 Au012	Davidsville Gp. small gabbroic intrusion	pyr, asp, (Au)	1.8 g/t Au (gs)	Weakly altered gabbro with disseminated pyr and asp. Asp locally up to 5%	Tallman (1989a); P. Tallman pers. comm. (1994)
Greenwood Pond #2	59 ALT	630400 5387150	2D/11 Au013	Davidsville Gp. small gabbroic intrusion	pyr, asp, (Au)	5.27 g/t Au, 23.2 g/t Au (gs)	Weakly altered gabbro with disseminated pyr and asp. Asp locally up to 5%	Tallman (1989a); P. Tallman pers. comm. (1994)
Greenwood Pond #3	60 ALT	631750 5387750	2D/11 Au014	Davidsville Gp. small gabbroic intrusion	pyr, asp, (Au)	2.75 g/t Au (gs)	Weakly altered gabbro with disseminated pyr and asp. Asp locally up to 5%	Tallman (1989a); P. Tallman pers. comm. (1994)
Greenwood Pond #4	61 ALT	633050 5388400	2D/11 Au015	Davidsville Gp. small gabbroic intrusion	pyr, asp, (Au)	1.9 g/t Au (gs)	Weakly altered gabbro with disseminated pyr and asp. Asp locally up to 5%	Tallman (1989a); P. Tallman pers. comm. (1994)
Greenwood Pond #5	62 ALT	631150 5388200	2D/11 Au016	Davidsville Gp. small gabbroic intrusion	pyr, asp, (Au)	2.9 g/t Au (gs)	Weakly altered gabbro with disseminated pyr and asp. Asp locally up to 5%	Tallman (1989a); P. Tallman pers. comm. (1994)
Greenwood Pond #6	63 ALT	631150 5387650	2D/11 Au017	Davidsville Gp. small gabbroic intrusion	pyr, asp, (Au)	3.09 g/t Au (gs)	Weakly altered gabbro with disseminated pyr and asp. Asp locally up to 5%	Tallman (1989a); P. Tallman pers. comm. (1994)

Name	No.	UTM	MODS	Host Rock	Mineralogy	Assay Results	Comments	References
Greenwood Pond #7	64 ALT	631500 5388500	2D/11 Au018	Davidsville Gp. small gabbroic intrusion	(Au)	1.5 g/t Au (gs)	Weakly altered gabbro with disseminated pyr and asp. Asp locally up to 5%	Tallman (1989a); P. Tallman pers. comm. (1994)
Hunan (Beaver Brook)	65 QV	629950 5395550	2D/11 Sb001	Middle to Late Ordovician pebble greywacke	sb	Tallman (1991a) Trench >3.5% Sb over 2.2 m (cs) DDH 8.99% Sb over 7.23 m Roycefield Resources Ltd. Press Release, 1995. Reserves: 920 000 t of 4.47% Sb	Discovered by Noranda Exploration Company prospectors during follow-up to 8 km long stream silt and 4.5 km long soil sb anomalies. Noranda excavated 9 trenches and drilled 4 diamond-drill holes. Three styles of fracture-controlled veins: 1) massive sb; 2) sb-quartz veins; and 3) sericite – chlorite veinlets with minor sb. Individual veins up to 25 cm wide, form zones of parallel veins up to 1.6 m wide. Underground bulk sampling program undertaken by Roycefield Resources Ltd.	Tallman (1989c); Tallman (1991a) Tallman and Evans (1994); Roycefield Resources Ltd. Press Release (1995)
Xingchang	66 QV	629200 5395050	2D/11 Sb002	Middle to Late Ordovician graphitic shale	sb	Tallman (1991a) DDH 33% Sb over 0.5 m	Located 900 m SW of the Hunan prospect. The sb is hosted by fracture-controlled, 1-3 cm wide, drusy quartz veins	Tallman (1989c); Tallman (1991a); Tallman and Evans (1994)
Szechuan	67 QV	633050 5397150	2D/11 Sb003	Middle to Late Ordovician siltstone	sb	NA	Located 3.6 km NE of the Hunan prospect. The sb is hosted by 1-3 mm wide veinlets	Tallman (1989c); Tallman (1991a); Tallman and Evans (1994)
Great Rattling Brook	68 QV	590100 5385500	2D/12 Au001	Pipestone Pond Complex	pyr. (Au)	2.3 g/t Au (gs)	Vuggy quartz-breccia veins within interleaved carbonatized ultramafic rocks and pyr-bearing black graphitic shale. The quartz veined area is approximately 0.5 m wide and 1.5 m long	MacKenzie (1990)

Glenwood – Notre Dame Bay

Name	No.	UTM	MODS	Host Rock	Mineralogy	Assay Results	Comments	References
Commanche/ Apache	69 QV	646200 5425350	2D/14 Au001	Mt. Peyton Intrusive Suite diorite (Figure A2.2)	pyr, asp, (Au)	1.3 g/t Au (gs)	Two narrow zones of sericitic alteration, 0.7 and 0.8 m wide, discovered by Noranda Exploration Company Limited prospectors in 1989. The zones, which trend 30° and 60°, dip 60°-68°E and contain disseminated pyr, asp and minor quartz veining (Figure 2.4)	Tallman (1990b)
Hurricane	70 QV	645150 5425150	2D/14 Au002	Mt. Peyton Intrusive Suite diorite (Figure A2.2)	pyr, asp, (Au, Ag)	Tallman (1990b) 166 g/t Au and 11.4 g/t Ag (gs) 4.6 g/t Au over 1.1 m (cs) Tallman (1991a) DDH MP-90-05 7.9 g/t Au over 1.0 m DDH MP-90-12 4.33 g/t Au over 1.7 m DDH MP-90-07 6.1 g/t Au over 1.5 m	Discovered by Noranda Exploration Company Limited prospectors in 1989. A >2 m wide, 22° trending, zone of strongly sericitic and pyritized diorite cut by quartz-pyr-asp stockwork (Figure 2.4). Tested by 6 diamond drill holes over a strike length of 1.8 km (Figure 2.5). Drilling at the discovery outcrop (MP-90-05) intersected 3 mineralized and altered zones which are between 3.1 and 12.7 m thick. The widest zone was the most strongly mineralized with one narrow interval assaying 7.9 g/t Au over 1.0 m (Figure 2.5)	Tallman (1990b, 1991a)
Corsair	71 QV	644350 5425300	2D/14 Au003	Mt. Peyton Intrusive Suite diorite (Figure A2.3)	pyr, asp, (Au)	Tallman, 1990b 3.2 g/t Au (gs) Tallman, 1991a DDH MP-90-03 2.30 g/t Au over 2.9 m, 1.02 g/t Au over 1.05 m	In 1989, Noranda Exploration Company Limited prospectors discovered a 3-4 m wide zone of strongly sericitized diorite containing disseminated pyr and asp and quartz veining (Figure 2.4). Diamond drilling (5 holes) indicated that the zone was between 10 to 30 m thick and composite, consisting of numerous 0.2-5 m wide bands of sericite, carbonate and minor leucoxene alteration (Figures 2.5 and 2.6). Altered and fresh wall-rock contacts are either sharp or gradational over 30-50 cm. Pyr and asp occur both as disseminated fine-grained euhedral crystal and as coarse patches locally concentrated along quartz-carbonate veins	Tallman (1990b, 1991a)

Name	No.	UTM	MODS	Host Rock	Mineralogy	Assay Results	Comments	References
Peyton	72 QV	644850 5425500	2D/14 Au004	Mt. Peyton Intrusive Suite diorite (Figure A2.3)	asp, pyr, cp, gn, sp, (Au, Ag)	DDH MP-90-10 1.7 g/t Au and 14.1 g/t Ag over 10 cm DDH MP-90-11 7.6 g/t Au over 0.2 m	A 4 m wide zone of strongly sericitized and weakly silicified diorite intersected in 2 of 4 diamond-drill holes (Figure 2.5). The zone contains narrow 1-10 cm wide vuggy quartz veins with semi-massive asp, pyr, cp, gn and sp	Tallman (1991a)
Bowater	75 QV	656100 5426900	2D/15 Au003	Davidsville Gp. graphitic shale and greywacke	pyr, (asp)	up to 20 g/t Au (gs) Trench 8845 ppb Au over 1.0 m and 3200 ppb Au over 1.0 m (cs) DDH 0.66 g/t Au over 1.5 m and 2.0 g/t Au over 0.8 m	Discovered by Noranda Exploration Company Limited in 1987, trenched and diamond drilled (3 holes totalling 194.4 m). The prospect consists of narrow (up to 10 cm wide) extensional and minor shear-controlled, milky-white, quartz – pyr veins and quartz breccia developed mainly within weakly sericitized and carbonate-altered, black, quartz – feldspar-rich greywacke (Figure 2.7)	Woldeabzghi (1988)
Sabre	77 QV	646850 5425200	2D/15 Au005	Mt. Peyton Intrusive Suite diorite (Figure A2.3)	pyr, asp, (Au, Ag)	up to 2.1 g/t Au and 47.6 oz/t Ag (gs)	A small silicified pod containing abundant fine-grained pyr and asp within a 0.75 m wide aplite dyke discovered by Noranda Exploration Company Limited prospectors in 1989	Tallman (1990b)
Gander Airport	78 EPI	678050 5421050	2D/15 Pyr004	Gander Group greyish-green pelites	pyr	No significant Au values have been reported from the zone.	Prospected by South Coast Resources Limited and described as a zone of epithermal alteration up to 50 m wide and 1.8 km long. The zone consists of an outer intensely quartz veined and weakly hydrothermally brecciated margin which grades into an inner zone of pervasive silicification (opaline silica), intense hydrothermal brecciation (cockade textures and possible geyserite eggs) and vuggy, cockscomb-textured quartz stockwork. Breccia fragments are angular near the outer margin of the zone but have diffuse outlines within the intensely silicified portions of the zone. Minor fine-grained pyr occurs within the breccia. Small pink feldspar phenocrysts occur locally throughout the zone. At Gander Lake the zone is in contact with a small gabbro intrusion. Silica, epidote, pyr and po are developed along the contact and angular gabbro fragments occur within the hydrothermal breccia	Dearin (1990); Dearin and Jacobs (1991)

Weir's Pond	79 QV	688300 5455950	2E/01 Au002	Gander River Complex mafic volcanic rock	asp, (Au)	Lenters (1986) up to 650 ppb Au (gs) Lenters (1988) DDH 2.5 g/t Au over 10 cm	Discovered by Esso Mining (Canada) Limited in 1986. The prospect has been trenched and tested with 7 short diamond-drill holes. The showing consists of a series of en echelon tension gash quartz-carbonate veins. Two vein sets are exposed, the dominant set trends 30°/55°E and the second set which consists of small quartz veinlets trends 170°/60°E. Veins in the dominant set are up to 5 cm wide and 3-4 m long. The veins locally are weakly laminated and contain wallrock fragments and small patches of sulphide. Narrow haloes of intense silicification and carbonate alteration are developed within the wallrock adjacent to the veining. Fine-grained pyr and small needles of asp (2 to 3 mm long) are disseminated throughout these haloes. In areas of intense veining these haloes coalesce to form larger zones up to 10's of metres wide	Lenters (1986); Lenters (1988)
Burseys Hill	80 DIS	682600 5446550	2E/01 Au004	Gander River Complex talc-carbonate schist	cr, pyr, (Au)	Saunders and Sheppard (1992) 2.51 g/t Au and 3.51 g/t Au (gs) 745 ppb Au over 0.5 m and 530 ppb Au over 1.0 m (cs)	Narrow 4-5 m wide rusty-weathering zones of creamy-beige talc-carbonate schist are developed within clinopyroxenite. Within these rusty zones talc and carbonate form segregations and patches which are developed along small foliation parallel shears (10°/85°W) and within minor breccia. These segregations are less developed outside of the rusty zones. Minor fine-grained pyr is associated with these zones. Cr grains are common to both the talc-carbonate schist and the pyroxenite	Evans (1992); Saunders and Sheppard (1992)
Third Pond	83 QV	671050 5442150	2E/02 Au003	Davidsville Gp. shale	pyr, mo, gn, (Au)	4.6 g/t Au (gs) Trench 0.8 g/t Au (width unknown)	Discovered by Falconbridge Limited in 1987. The Au occurs within cherty concretions and extensional quartz-sulphide veins developed within a narrow zone of silicified and graphitic shale. The zone was traced for approximately 400 m along strike	Butler (1989)

Name	No.	UTM	MODS	Host Rock	Mineralogy	Assay Results	Comments	References
Knob Hill	84 QV	674400 5446200	2E/02 Au004	Davidsville Gp. greywacke	pyr, (Au)	2.7 g/t Au (gs)	Narrow quartz – pyr veins developed within chloritic greywacke	R. Strickland pers. comm., (1991)
Cripple Creek	85 QV	681250 5450500	2E/02 Au005	Gander River Complex	pyr,asp, (Au)	9.6 g/t Au (gs) 2.84 g/t Au over 0.9 m (cs)	Quartz – asp – pyr veins and disseminations within altered trondhjemite	Sheppard and Strickland (1990)
Virginia Holdings/ Trench 11		Confi-dential	2E/02 Au006	Davidsville Gp. gabbro	NA	9.0 g/t Au and 109.6 g/t Au (gs)	Quartz veining within sheared gabbro and graphitic shale	Manor Resources Incorporated Limited, Press Release (1992)
Rat Pond SE	86 ALT	631650 5457350	2E/02 As002	Goldson conglomerate - rhyolite	asp, pyr (Au)	Zurowski (1975) 0.02 oz/t and 0.07 oz/ Au (gs) Pickett (1990b) 625 ppb Au (gs)	Discovered by International Mogul Mines Limited in 1973-74. Highly siliceous rock (rhyolite) containing up to 7% asp and 5% pyr as disseminations and veinlets	Zurowski (1975) Reusch (1985) Pickett (1990b)
Foot Pond	87 ALT	656900 5456050	2E/02 As003					
Shoal Point		?	2E/03	Lawrence Harbour volcanics, gabbro	asp, pyr, cp, (Au)	4.67 g/t Au over 0.6 m and 3.68 g/t Au over 0.5 m	Quartz – carbonate veins in sheared gabbro	Tuach (1992)
Powerhouse Cove	88 QV	642550 5465450	2E/06 Au001	Dunnage Mélange siliceous dyke	asp, (Au)	Evans (1992) 92 ppb Au, 48 ppb Au, 222 ppb Au (gs of dyke) 145 ppb Au, 78500 ppb Au (gs of quartz vein)	Discovered in 1989 by Quincy Sheppard a local prospector. The showing comprises a 2 m thick, east-west trending, siliceous, aphanitic felsic dyke which has intruded black graphitic shales of the Dunnage Mélange (Figure 2.8). The dyke is offset by a series of small faults developed parallel to the regional penetrative fabric in the shales. These faults produced narrow (<3 cm), brittle, quartz-filled, fractures within the dyke. Locally these quartz veins contain massive patches of pyr and asp	Evans (1992)
Porterville area	89 QV	631650 5457350	2E/06 Au002	Wild Bight Gp. gabbro	asp, pyr, (Au)	Butler (1990); Tuach (1992) up to 17.3 g/t Au over 0.35 m	Fracture-controlled carbonate and leucoxene alteration associated with quartz-carbonate stockwork veins developed in gabbro and mafic volcanic rocks	Butler (1990); Tuach (1992)

Pond Island	90 QV	640400 5478600	2E/06 Sb001	Long Island Granodiorite	tet, Bi, sp, cp, pyr, (Ag, Au)	Heyl (1936) 5 oz/t, 4 dwts, 12.8 gr. Ag, 1.50% Bi, 13.29% Sb, 0.50% Zn, 3.65% Cu, 12.60% S, (Trace Au) (gs) Evans (1992) <1.0 g/t Au, 1330 g/t Ag, 5.82% Cu, 1.67% Zn, 3.67% Sb, 1.83% As, 0.993% Bi (gs)	A series of small joint/fracture-controlled (25°/65°N) anastomosing quartz-carbonate veins up to 15 cm wide developed within a coarse-grained granodiorite. The veins are locally banded and exhibit comb textures and crystal lined vuggs. The banding consists of patches of sp and tet along the vein margins, comb-textured quartz and a central calcite-ankerite band. Acicular bismuthinite crystals up to 2.5 long occur both in the veins and in the wallrock adjacent to the veins. Alteration consisting of silicification and sericitization extends up to 1.0 m from the veins. The granodiorite near the mineralized veins has been intruded by a rhyolite porphyry stock	Heyl (1936); Evans (1992)
Stinger	91 ALT	671075 5464925	2E/07 Au001	Davidsville Gp. siltstone	pyr, asp, (Au)	Green (1989a) 1.0 g/t Au over 10.6 m including 4.01 g/t Au over 1.0 m (cs) 30.1 g/t Au (gs)	Discovered by Noranda Exploration Company Limited in 1988. One diamond-drill hole, drilled in 1990. Exposed at the outflow of Rocky Pond is a 10-50 m wide zone of intense silica, sericite and carbonate alteration developed within sheared siltstone. Asp and pyr occurs both within quartz veins and as disseminations in the altered wall rock. Quartz veins are up to 40 cm wide and locally contain angular wall rock fragments	Green (1989a); Tallman (1990d); Evans (1991) Churchill *et al.* (1993)
Flirt	93 ALT	670650 5465025	2E/07 Au003	unnamed gabbro	pyr, asp, (Au)	Green (1989a) 9.6 g/t Au (gs)	Pyr- and asp-bearing quartz – carbonate veins developed within carbonate and chlorite-altered gabbro	Green (1989a); Churchill and Evans (1992)
Burnt Lake	96 QV	676400 5460150	2E/07 Au006	Davidsville Gp. gabbro sill	pyr, (Au)	Green (1989a) up to 277 ppb Au (gs)	A single trench exposed a 0.6 m wide gabbro sill which has intruded into a sequence of black shale. Quartz veins developed within the sill contain up to 2 percent pyr. In excess of 1000 fine delicate gold grains were recovered from a till sample collected from the trench. The mineralization exposed in the trench was not thought to be the source of these grains	Green (1989a)

Name	No.	UTM	MODS	Host Rock	Mineralogy	Assay Results	Comments	References
Western Indian Islands	98 QV	699380 5493400	2E/09 Au001	Indian Islands Gp. feldspar porphyritic dyke	asp, (Au, Ag, Pb, Zn, Cu)	Dean (1978a) 8 g/t Au, 550 ppm Cu, 170 ppm Zn, 175 ppm Pb, 2.4 ppm Ag	Quartz veins, up to 10 cm wide and trending 120° are developed with a siliceous, feldspar porphyritic dyke. The veins contain abundant patches and stringers of asp and pyr. The dyke trends 55° and contains abundant fine-grained disseminated pyrite	Dean (1978a); Evans (1992)
Stewart Mine	100 QV	655100 5494000	2E/10 Au001	Moretons Harbour Gp. diabase dyke	asp, pyr, sp, cp, sb, (Au, Ag)	Moreton's Harbour Mining Company Limited (1971) 0.09 oz/t Au, 0.29 oz/t Ag (gs from ore dump) Tuach (1992) 18.3 g/t Au and 1.6 g/t Ag (gs), 10.9 g/t Au and 30.4 g/t Ag over 0.15 m (cs)	Shaft (30-33 m deep) dating from the late 1800s, at which time 125 tons of auriferous asp ore were removed. Quartz – carbonate veins (up to 23 cm wide) and veinlets developed along silicified and brecciated margin of diabase dyke. The veins are vuggy, banded and exhibit well developed comb textures. Abundant small euhedral asp crystals are disseminated throughout the silicified zone. The strike length of the zone exceeds 400 m	Hyel (1936); Gibbons (1969); Kay (1981); McBride and Butler (1988); Tuach (1992)
Little Harbour	102 QV	654970 5493580	2E/10 Au003					
Taylors Room	101 QV	654000 5493950	2E/10 Au002	Moretons Harbour Gp. mafic volcanic rocks	asp, sp, cp, pyr, (Au, Ag)	Sheppard (1984) Trench 0.2% Cu, 0.016% Pb, 0.46% Zn, 0.8 oz/t Ag and 0.037 oz/t Au over 1.95 m (cs) 0.9% Cu, 0.92% Zn, 1.73 oz/t Ag and 0.06 oz/t Au (vein gs) Fogwell (1965); Moreton's Harbour Mining Company Limited, 1971 DDH 1.0 g/t Au over 1.0 m and 2.0 g/t Au over 0.45 m	Exposed in several old trenches are 3 quartz veins which are hosted by sheared mafic volcanic rock. The central vein is 10-30 cm wide, trends 27°, dips 62°-75°SE and has been traced for approximately 122 m along strike. The outer veins are up to 18 cm wide. The veins are milky white and locally well mineralized. Disseminated and veinlets of sulphides are present within the wall rock up to 3.4 m from the veins. Newfoundland and Labrador Corporation drilled 2 diamond-drill holes on the prospect in the early 1960's	Snelgrove (1935); Fogwill (1965); Moreton's Harbour Mining Company Limited (1971); Kay (1981); Sheppard (1984)
Moreton's Harbour Head Gold	103 QV	654150 5494700	2E/10 Au004	Moretons Harbour Gp. mafic volcanic rocks	pyr, asp, (Au, Sb)	9.11 g/t Au, up to 6.25% As and 368.0 g/t Sb (gs)	Pyr-asp-bearing, narrow quartz-carbonate veins developed within mafic volcanic rocks	Dimmel and Jacobs (1989)
Pomley Cove	104 DIS	652800 5495350	2E/10 Au005	Moretons Harbour Gp. mafic volcanic rocks	pyr, asp, po, (Au, Sb)	4.79 g/t Au, up to 9.35% As and 835 g/t Sb	Pyr-asp-bearing, narrow quartz-carbonate veins developed within mafic volcanic rocks	Dimmel and Jacobs (1989)

Moreton's Harbour Pond	105 UK	652950 5494350	2E/10 Au006	Moretons Harbour Gp. felsic volcanic rocks	pyr, asp (Au, Ag)	up to 420 ppb Au, 2.8% As, 60 ppm Sb and 5.5 g/t Ag (gs) up to 3.02 g/t Au from a large angular asp-rich boulder	The showing consists of pervasive pyr, asp and sb mineralization associated with hydrothermally fractured, quartz veined, silicified and sericitized felsic volcanic rocks. The sulphide mineralization, up to 10%, forms lenses and bands associated with the quartz stockwork veining. Pyr and asp also occur as weak disseminations in the altered wallrock. The felsic rocks are pale pink and buff to cream coloured and where sericitized are apple green	Dimmel and Jacobs (1989)
Moreton's Harbour #1	106 UK	654525 5493800	2E/10 Au007	Moretons Harbour Gp.	NA	2546 ppb Au (gs)	NA	McBride and Butler (1988)
Moreton's Harbour #2	107 UK	654475 5493600	2E/10 Au008	Moretons Harbour Gp.	NA	4250 ppb Au (gs)	NA	McBride and Butler (1988)
Moreton's Harbour #3	108 UK	655100 5493900	2E/10 Au009	Moretons Harbour Gp.	NA	3790 ppb (gs)	NA	McBride and Butler (1988)
Moreton's Harbour #4	109 UK	655100 5493500	2E/10 Au010	Moreton's Harbour Gp.	NA	4600 ppb Au (gs)	NA	McBride and Butler (1988)
Moreton's Harbour #5	110 UK	655750 5494150	2E/10 Au011	Moreton's Harbour Gp.	NA	2500 ppb Au (gs)	NA	McBride and Butler (1988)
Moreton's Harbour #6	111 ALT	654850 5492950	2E/10 Au012	Moreton's Harbour Gp.	NA	4860 ppb Au (gs)	NA	McBride and Butler (1988)
Fairbanks Turn	112 ALT	665200 5491650	2E/10 Au013	Samson Greywacke	pyr, asp, (Au)	1.28 g/t Au (gs)	A 1.5 m wide carbonate and silica altered shear zone with disseminated asp and pyr	French (1988)
Dildo Run	113 QV	664950 5490800	2E/10 Au014	Samson Greywacke	asp, pyr, (Au)	1.2 g/t Au (gs), 0.56 g/t Au over 7.6 m (cs)	Disseminated asp and pyr developed within sheared greywacke and a felsic porphyry dyke	French (1988)

Name	No.	UTM	MODS	Host Rock	Mineralogy	Assay Results	Comments	References
Cross (Frost) Cove Mine	114 QV	654100 5493400	2E/10 Sb001	Moretons Harbour Gp. felsic dyke	sb, asp, sp, gn, cp, (Au)	Snelgrove (1935) 125 Au-Sb ore shipped in 1897 Moreton's Harbour Mining Company Limited (1971) 0.18 oz/t Au, 0.18 oz/t Ag, 0.24% Cu, 8.89% Pb, 4.92% Zn and 0.18% Sb (gs of footwall vein, upper adit) Sheppard, 1984 2.85% Sb, 0.006% Pb, 0.047 oz/t Ag and 0.0015 oz/t Au over 1.8 m (cs). Included hanging wall vein 27.2% Sb over 0.1 m and footwall vein 8.5% Sb over 0.25 m.	Three short-lived attempts at mining were undertaken; 1889 or 1890 mining commenced; 1906; and during the First World War. Mineralization consists of two narrow quartz-sb veins developed on either side of a felsic dyke. The veins with a maximum width of 30 cm are developed along the hanging wall-footwall contacts of a 2.0 m wide felsic dyke. The dyke and mineralization trend 20°, dip 80°NW, extend to Sb002, and have been traced for 790 m along strike. In the mid 1960's the Newfoundland and Labrador Corporation drilled 2 diamond-drill holes in the vicinity of the old mine	Snelgrove (1935) Moretons Harbour Mining Company Limited (1971) Sheppard (1984)
Moreton's Harbour Sb	115 QV	653700 5492800	2E/10 Sb002	Moretons Harbour Gp.	sb, gn, pyr, (Au)	Sheppard (1984) 1.34% Sb, 0.15% Pb, 0.35 oz/t Ag and 0.04 oz/t Au over 2.64 m (cs) Included hanging wall vein 0.018% Sb, 2.4% Pb, 1.25 oz/t Ag over 0.5 m, footwall vein 39.2% Sb, and a narrow interval which assayed 0.22 oz/t Au over 0.4 m.	See description for Cross Cove Mine 2E/10 Sb001	Snelgrove (1935) Moreton's Harbour Mining Company Limited (1971); Sheppard (1984)

Addendum to Victoria Lake – Millertown

Name	No.	UTM	MODS	Host Rock	Mineralogy	Assay Results	Comments	References
Big Arm	116 QV	466725 5353800	12A/06 Au011	Victoria Lake Gp.	(Au, Ag), gn, sp. pyr	0.5 oz/ton Au, 0.6 oz/ton Ag, 0.2% Pb, 0.3% Zn, 3.0% Fe; 0.8 oz/ton Au, 4.5 oz/ton Ag, 1.7% Pb, 0.2% Zn, 7.0% Fe (gs)	Discovered and sampled by G.F. Laycock for the Anglo Newfoundland Development Co. in 1928. Located on a small island in Henry Waters, Victoria Lake, presently flooded. Described as a quartz vein(s) up to 5 feet in width.	G. Thurlow, pers. comm. (1996)
Rip Van Winkle	123 ALT	591225 5417850	2D/13 Au002	Victoria Lake Gp.	(Au), asp, cp, sp, gn, pyr	1.42 oz/ton Au (gs)	Shear-hosted quartz veins, dessiminated sulphides occur in the wallrock adjacent to the veins.	D. LaRiche, pers. comm. (1996)

Addendum to Glenwood – Notre Dame Bay

Name	No.	UTM	MODS	Host Rock	Mineralogy	Assay Results	Comments	References
Virginia Holdings/ Trench 11	117 QV	658800 5432150 approx.	2E/02 Au006	Davidsville Gp.	NA	9.0 g/t Au and 109.6 g/t Au (gs)	Quartz veining within sheared gabbro and graphitic shale	Manor Resources Incorporated Limited, Press Release (1992)

Robert's Arm Area

(Showings not discussed in text, but indicated on Map 96-21)

118 Handcamp (12H/08, Au001); 119 Bear Cove (2E/05, Au001); 120 Fifields Pond (2E/05, Au002); 121 Chignic (2E/05, Au003); 122 Shamrock (2E/12, Zn002)

Abbreviations used in Appendix. **QV** - quartz vein; **DIS** - disseminated; **ALT** - altered wallrock; **EPI** - epithermal; **UK** - unknown; NA - not analyzed. cs - channel sample; gs - grab sample; ddh - diamond-drillhole; ppb - part per billion; ppm - part per million; g/t - grams per tonne; dwts - pennyweight; and gr - grain. Mineral abbreviations: pyr - pyrite; po - pyrrhotite; cp - chalcopyrite; gn - galena; sp - sphalerite; asp - arsenopyrite; sch - scheelite; ba - barite; tet - tetrahedrite; sb - stibnite; bo - bornite; mo - molybdenite; and mir - millerite. Commodity abbreviations: Au - gold; Ag - silver; S - sulphur; Bi - bismuth; Zn - zinc; Cu - copper; and As - arsenic. () denotes commodity is present in trace amounts.

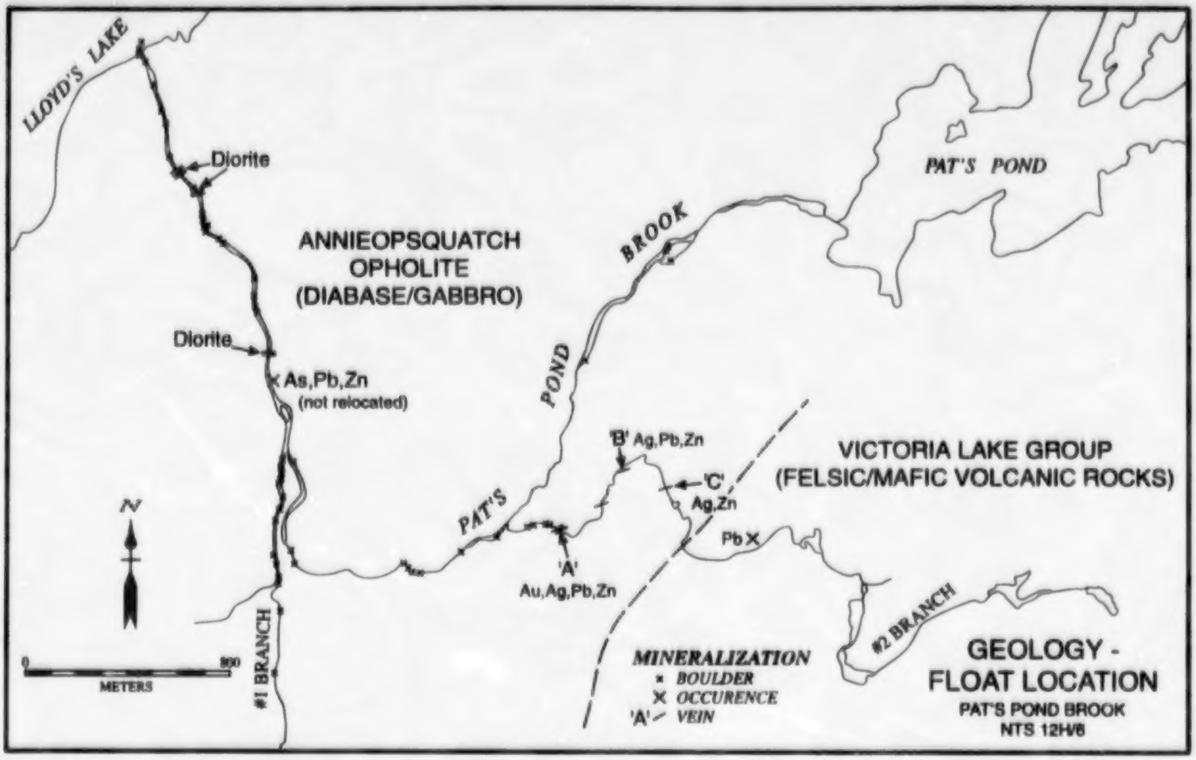


Figure 2.1. *General geology of the Pats Brook area, showing the locations of mineralized float and showings (from a Department of Mines and Energy map produced by Paul Delaney, 1986).*

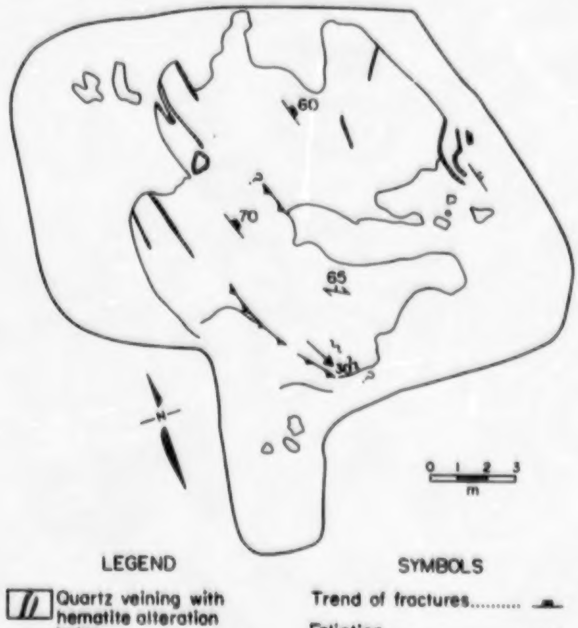


Figure 2.2. *General geology of the Breccia Pond prospect (modified after Graham, 1990).*

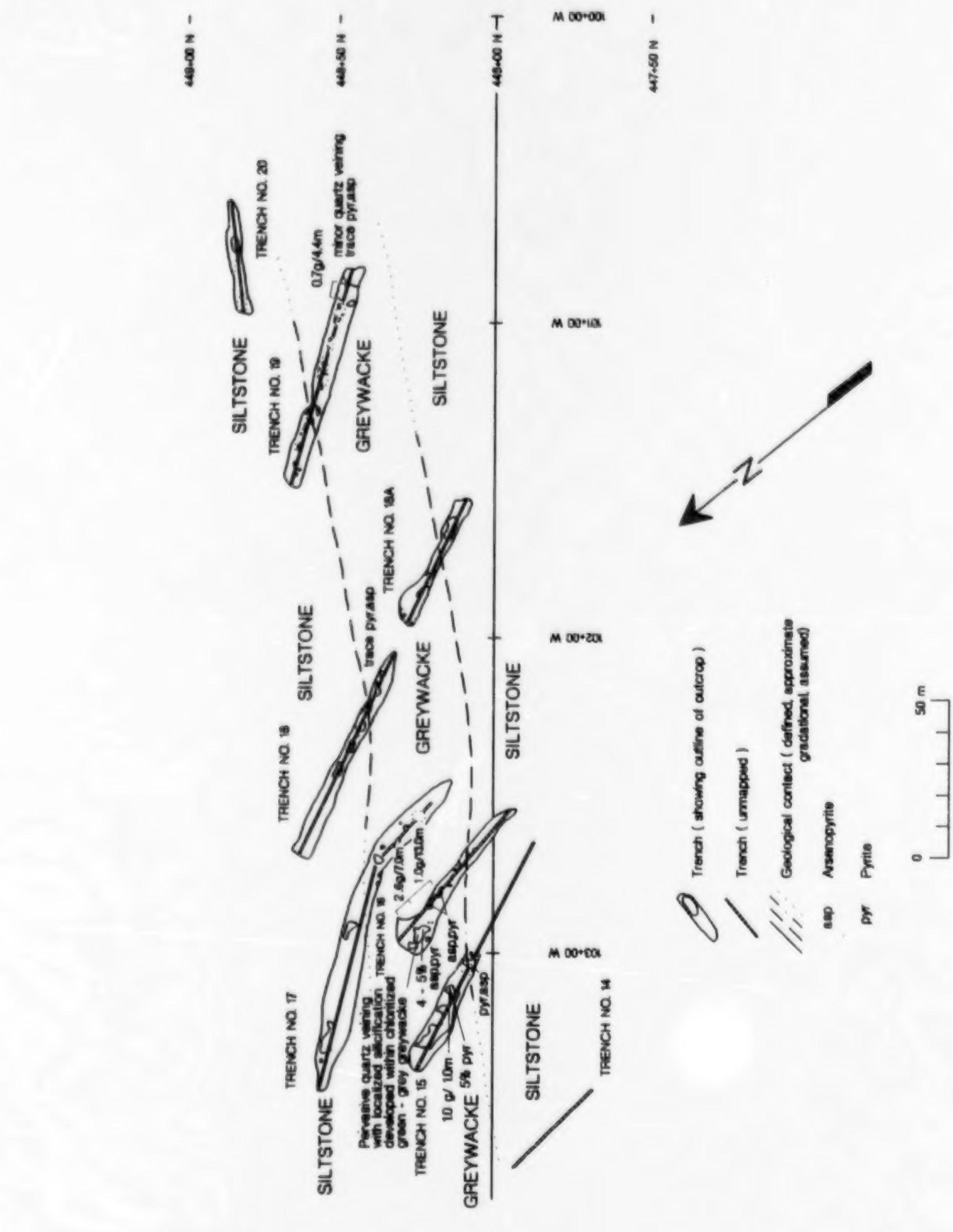
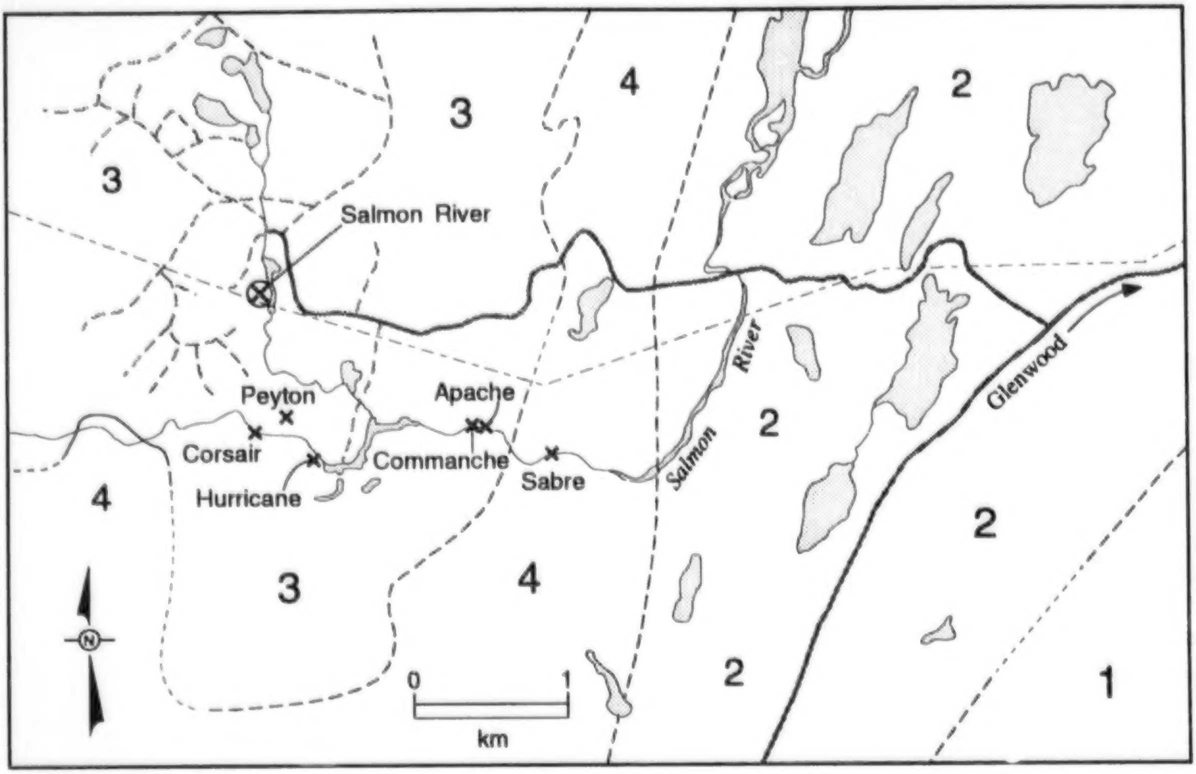


Figure 2.3. *Geology and trench location map, A-Zone Extension (modified from Tallman, 1989a).*



LEGEND

SILURIAN-DEVONIAN

Mount Peyton Intrusive Suite

4	Pink, biotite granite
3	Grey gabbro and minor quartz diorite

SILURIAN

2	Red and green, micaceous sandstone and siltstone

UPPER ORDOVICIAN

1	Grey to green sandstone

SYMBOLS

Geological contact (defined, approximate, assumed.....................

Float...

Transmission line...............................

Road...

Trail...

Figure 2.4. *Geology and location map Mount Peyton-Salmon River area (modified from Dickson, 1993).*

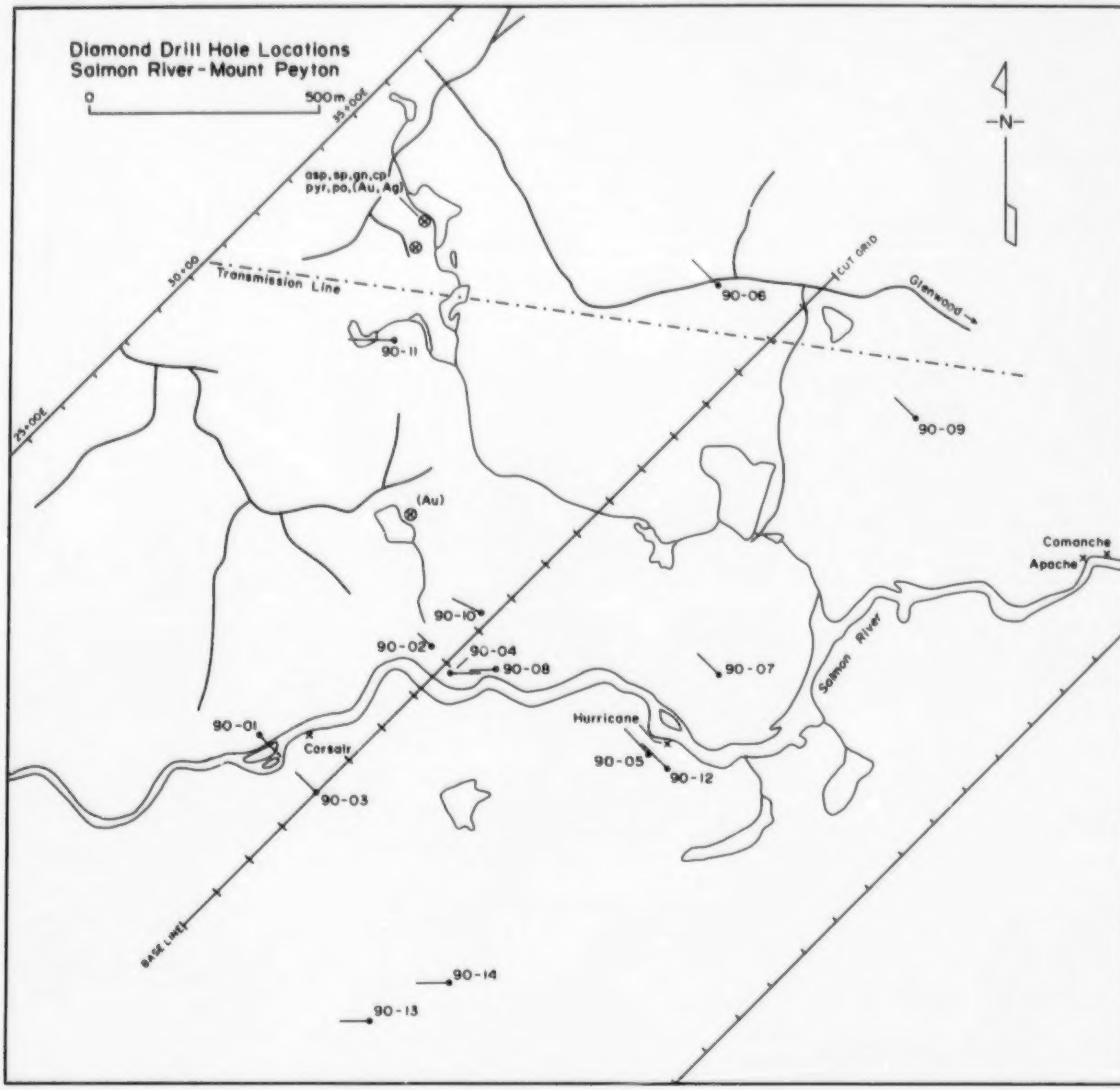


Figure 2.5. *Diamond drill hole location map Mount Peyton-Salmon River area (modified from Tallman, 1991c).*

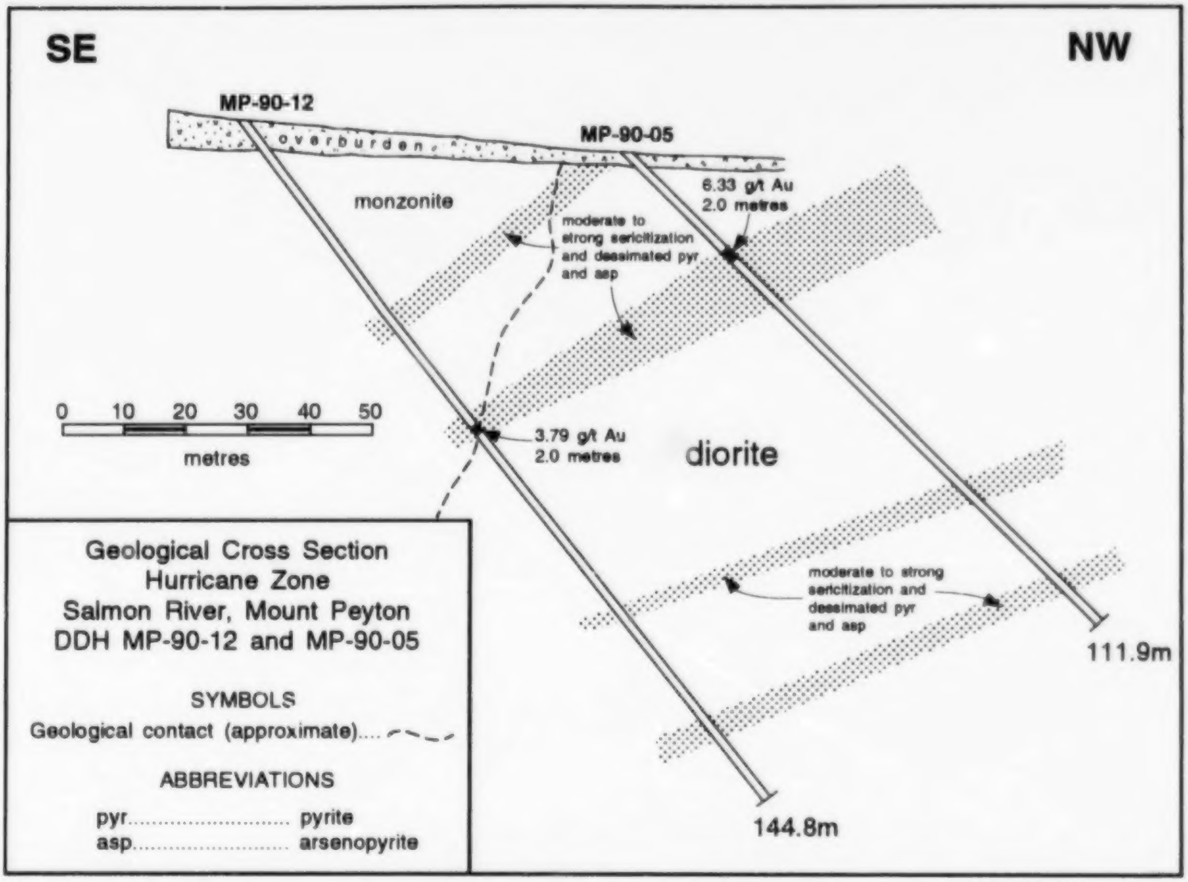


Figure 2.6. *Diamond drill cross section, Hurrican prospect (modified from Tallman, 1991c).*

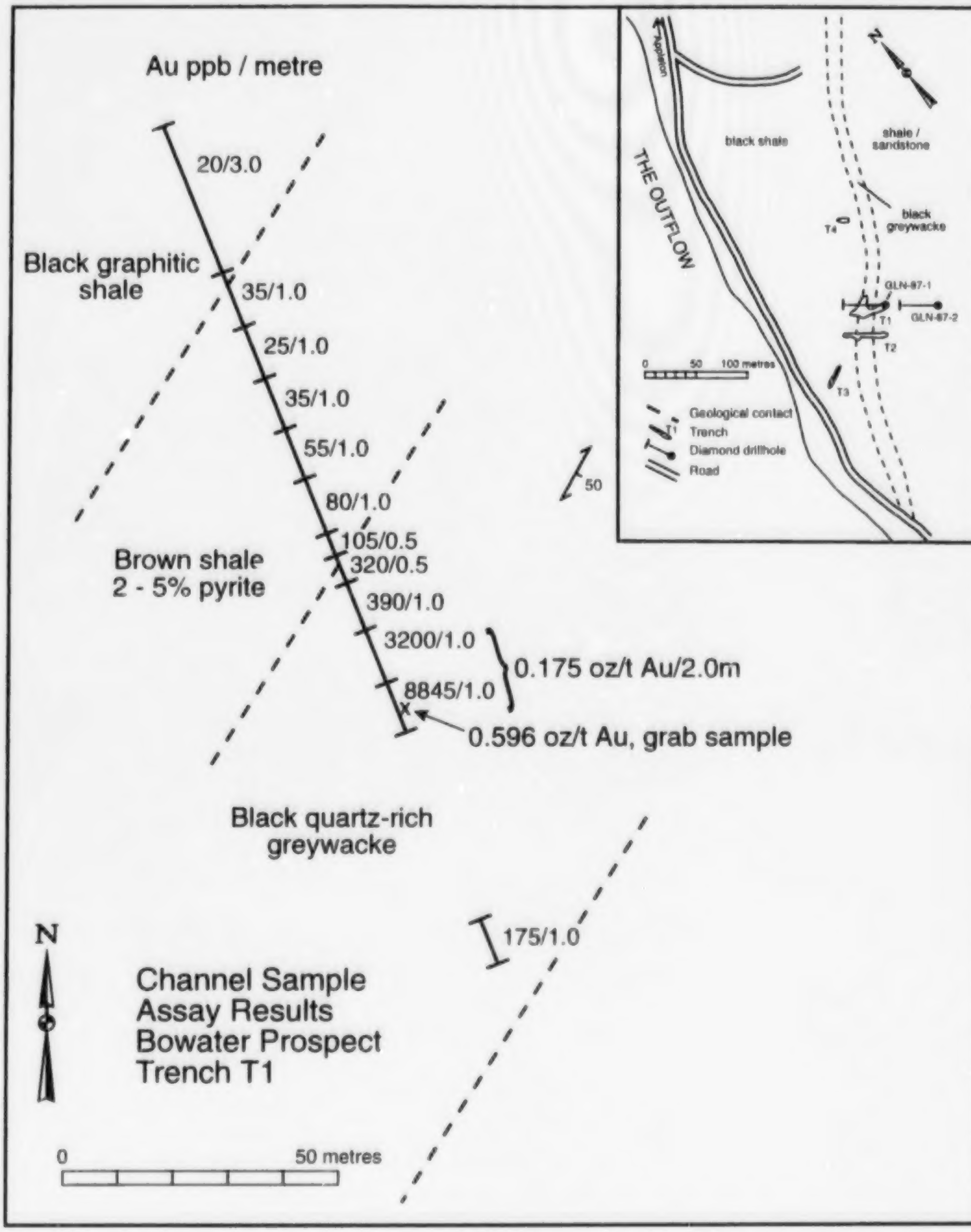


Figure 2.7. *Geology and channel sample results, Bowater prospect (modified after Woldeabzghi, 1988).*

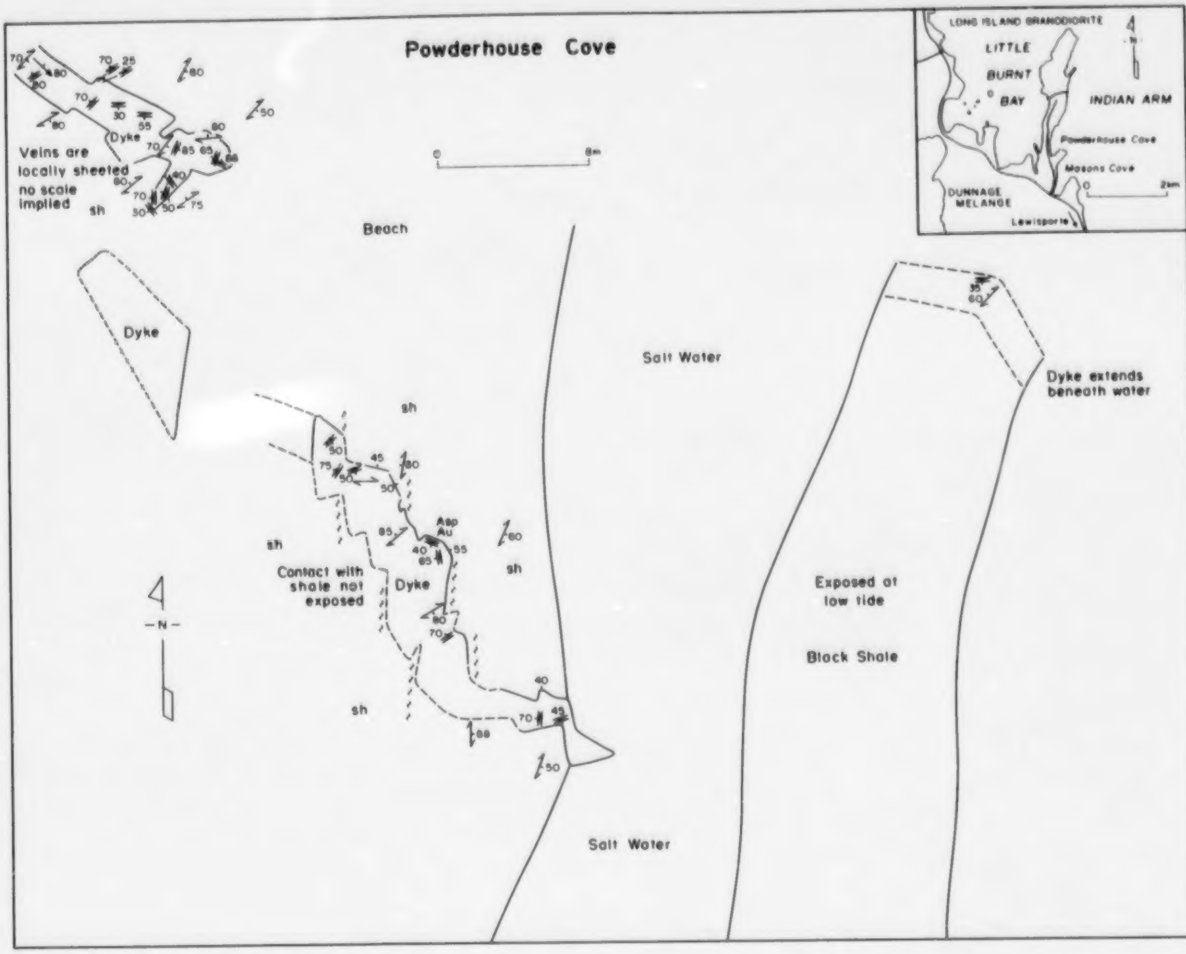


Figure 2.8. *Geological map of the Powderhouse Cove showing, Notre Dame Bay.*

MAPS NOT FILMED

CARTES NON REPRODUITES